Medical Writing

WALTER C ALVAREZ

HUGH CLEGG

FELIX MARTI IBAÑEZ

HANS SELYE

HENRY E SIGERIST

M D PUBLICATIONS INC

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ON MEDICAL WRITING

The continuous growth of medicine as a theoretical science and as a practical art has increased the problem of developing medical communication to the utmost.

Medical communication today avails itself of such valuable tools as films, radio and television, but the printed word is still considered the most direct, useful and permanent vehicle.

Ever since Carlyle admitted that he had read Kant's *Critique* without understanding a word of it, many have complained that much of medical and scientific writing is incomprehensible.

The rules of good writing apply just as much to medical as to literary writing. W Somerset Maugham's three rules for good writing—euphony lucidity and clarity—also apply to medical writing. Unhappily these rules are not always followed, not even by the most brilliant men of medicine.

This situation prompted the INTERNATIONAL RECORD OF MEDICINE AND GENERAL PRACTICE CLINICS to organize a symposium on Medical Writing, the proceedings of which are here reproduced. The sound advice and practical examples presented here should prove of inestimable value to both the novice and the experienced medical writer who accepts the fact that the more one knows about anything, the more one should try to learn about it.

The panel of authors includes editors of leading medical journals, medical historians, clinicians and investigators, all united in the field of medical writing by a common denominator—their creativity In this symposium on medical writing the physician will find not only good and practical advice on how to write but also on how to think and even on the art of reappraising words to determine which, like old coins, are worn by use and which still glitter with all their original luster The physician is also advised how to marshal his ideas before setting pen to paper and how to improve his style and the content of his writing by studying the literary and scientific masterpieces of all times.

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Henry E. Sigerist, M.D., D.Litt., LL.D., D.Sc., F.R.C.P.
PURA, TICINO, SWITZERLAND

I think it is an excellent idea to devote a number of this journal to the problems of medical writing although I am not quite sure that there is such a thing as medical, chemical, physical or agricultural writing. There is good writing and bad writing no matter what you write about, but I know that many physicians, young and old, are puzzled and worried when they have to write a paper. As an academic teacher who had to read student papers, as editor of several journals whose daily task was the reading and editing of papers I know what enormous difficulties many doctors experience when they have to express the result of their work and experiences in writing. So there can be no doubt that a series of articles devoted to this subject must be welcome.

There may be no medical writing in the strict sense of the word, but it is obvious that the style varies according to the subject under discussion. It makes a difference whether we write a poem, a literary essay or a scientific paper. The language used also makes a great difference. Cicero could write monster sentences and yet be perfectly clear. The German language permits the use of long sentences which seem obscure chiefly to those who do not master the language. French is perhaps the most elegant vehicle for carrying thought, scientific and otherwise, and many French medical writings, case histories of Charcot, papers of Pasteur, Claude Bernard's *Introduction à l'étude de la médecine expérimentale* are literary masterpieces. Few countries have insisted so much on style in scientific writing.

The English language is a marvelous instrument of precision and clarity. In English we can develop our thought in short sentences which fit together like the glass bricks with which we build a modern house. This does not mean that long sentences are impossible in English. One of the best stylists I know, Virginia Woolf, begins a superb essay, "On Being Ill," one that physicians would do well to read, with the following sentence:

> Considering how common illness is, how tremendous the spiritual change that it brings, how astonishing, when the lights of health go down, the undiscovered countries that are then disclosed, what wastes and deserts of the soul a slight attack of influenza brings to view, what precipices and lawns sprinkled with bright flowers a little rise of temperature reveals, what ancient and obdurate oaks are uprooted in us by the act of sickness, how we go down into the pit of death and feel the waters of annihilation close above our heads and wake thinking to find ourselves in the presence of the angels and the harpers when we have a tooth out and come to the surface in the dentist's arm-chair and confuse his "Rinse the mouth—rinse the mouth" with the greeting of the Deity stooping from the floor of Heaven to welcome us—when we think of this, as we are so frequently forced to think of it, it becomes strange indeed that illness has not taken its place with love and battle and jealousy among the prime themes of literature.

The essay is included in the collection *The Moment and Other Essays*, New York, Harcourt Brace & Co., 1948.

This certainly is a long sentence but it is clear as crystal from beginning to end, and what a world it evokes! One sentence makes us remember all the illnesses we ever had. Only a great poet can write so well and we pedestrians must remain closer to earth.

The two prerequisites for good writing particularly on subjects such as science and learning are clear thinking and command of the language in which one writes. I always found that people who thought clearly were able to express themselves clearly be it orally or in writing I have heard many very poor lecturers and they were invariably people whose thought was confused who jumped from one subject to another began sentences without finishing them and in general were just thinking aloud but not logically My own teacher in medical history Karl Sudhoff of the University of Leipzig was one of them. His knowledge was formidable and he simply poured it out over his audience in an undigested way and his writing was often confused also A lecture, just like a paper must have a beginning a development, a climax and an ending And let me add that every lecture even if it is just a routine classroom lecture should be prepared very carefully I have been lecturing in many countries in many languages for over 30 years, but still today I am frightened when I enter the lecture hall Of course the moment you face and address your audience the fear disappears and some magnetic bond is established between you and the people you talk to. At the end you are exhausted because you have given yourself out, body and soul I often thought that should I no longer be frightened before a lecture, that is should I no longer have the deep respect that is due an audience, any audience, the lectures would soon become very poor

What applies to a lecture applies in a much higher degree to the writing of a paper or still more of a book. The audience you address is larger and is not only today s, but also tomorrow s audience. When you talk you have more license than when you write. In a lecture you may use colloquial words which you must avoid in writing You may begin a sentence without finishing it, if the following sentence takes up and develops your thought. You may even, though one should not, use profane words to emphasize a point, but you should never do such things in writing

I think every writer develops his own technique in the course of time and I can discuss here only the advantages and disadvantages of my own way of writing When I have decided to write a paper or a book I feel pregnant with it for a long time, and since I have usually half a dozen literary projects pending I feel pregnant" with a whole litter I have the subjects constantly on my mind and make notes at any hour of the day or night. I always have sheets of paper of uniform size handy and every evening I sort the notes and put them into their respective folders Then comes the day when you are ready to begin writing Usually it is some pressure from outside that determines the date, an irate editor who reminds you that the deadline for your paper was three months ago or a publisher who has been waiting patiently for years for a manuscript but would now like to have it very soon. Life is short but the art is long and one never feels quite ready to write being too much aware of gaps in one s knowledge. Still unless one is a hopeless perfectionist the day comes when the paper has to be written and here the methods vary a great deal Some people are able to dictate a paper or even a book They correct what they have

said, it is retyped, and the work is done I am not one of them and dictate only lectures that I wish to publish, lectures for which I did a great deal of research and for which I have profuse notes. I never write a lecture before it has been delivered because a manuscript paralyzes me completely and also because I find that oral and written styles are different. This method, has the great advantage that it improves your lectures, because you have to think while you talk, which is usually not the case when you read a manuscript, and because you talk to an audience that is looking at you, not to unseen readers. It has the disadvantage as some of my friends have experienced, alas that it may take some time before they receive the promised manuscript because once the lecture is over other demands are piling up on you.

Some people write a paper in longhand or on the typewriter then rewrite it several times until they are satisfied with it. Emil Ludwig, a profuse writer once told me that when he had the materials for a book ready he wrote it very quickly in short hand. Every evening he sent what he had written to a secretary who lived at the other end of Switzerland Two days later he received the typed script, corrected it and thus had a book ready for the press in a very short time.

My method of writing is very different but it is one which has such highly respected predecessors as Emile Zola, Guy de Maupassant, and I am sure, many others. Once I am ready to write I make a short outline of not more than one page of the paper or in the case of a book, of the chapter Then every day I write a set number of pages in absolutely final form, ready for the press, with footnotes and all that goes with it. *It is a slow process I write in longhand in copybooks of folio size* that I have made especially for me. I write on the right hand page only the one to the left being left blank for footnotes and minor changes. As a rule I write five pages a day or about 700 words from 9 to 12 o clock in the morning It is not much but if you do it for 300 days a year you will produce quite enough literature. The rest of the day you need for research, for the preparing of next day s writing for the correction of galley proofs, correspondence, and an infinity of current affairs

I know it is generally recommended that scientific papers be as short and as factual as possible. As a result they are informative, to be sure, but make frightfully dull reading I know of famous medical journals in which every article is edited or even rewritten entirely by a highly competent staff of elderly ladies according to set standards and the result is that every article reads as if it had been written by the same person. This is just fatal. No two individuals are alike and no matter how factual an article is, we wish to get a grasp of the personality behind it.

I said that the prerequisites of good writing are clear thinking and command of the language in which you are writing The latter is a sore spot, particularly in America. We should expect that a medical student had acquired a thorough knowledge of English in college. Some have, but very many have not. In America, not a few physicians are foreign-born. I am one of them and I would like to give my colleagues a bit of advice. Work to improve your command of the language daily *and quite particularly during the first years!* After a while one acquires a rich enough vocabulary to express oneself fluently though with an trocious accent and making the same mistakes over and over again. I had the great advantage of having learned English as a child and of having spent some time in England before I came to

America but even so the change of my literary language was a great shock. I had written papers in French and Italian, very few in English. My first books were all written in German and I had developed my own style which was generally appreciated by critics. All of a sudden from one day to another I found myself transplanted into the Anglo-Saxon world and knew that from then on I would have to write every line in English. I knew the language well enough to write a paper or to capture the attention of an audience in a lecture, but writing a book was a different matter I had no trouble doing it but I felt that the style was poor and it still is not the style I had when I was writing in German. Yet I worked on improving my language from the first day on and I am still doing it today after 22 years.

My method is very simple and I can recommend it not only to foreign-born Americans but to everybody It consists of reading good writers critically I happen to like Aldous Huxley his style appeals to me very much and I find that we have many thoughts in common. When I first came to America I took some of his novels I had read them years before, but now I reread them, critically a few pages a day only analyzing the sentences and making notes of words that I would not have used but that struck me as being very expressive. I also made notes of entire sentences and in this way in a couple of years I increased my vocabulary and improved my syntax considerably I still follow the method The writers vary but I am more anxious than ever to improve my style

This brings me now to the doctor s reading I know well enough that his time is limited but he should be the more critical in the selection of his reading I think everybody no matter how busy he is should spend at least two hours a day reading

What should the physician read apart from professional literature that he must read to keep abreast of a fast developing science? Before we answer the question we must raise another one. To what end do we read? I think the answer is to learn to improve ourselves to enrich our life and make it more meaningful, and also to learn to express ourselves better We do not read to kill time because life is too short and time too precious to be killed thoughtlessly There are moments, to be sure that we would have preferred not to have lived, an unpleasant illness or a tedious journey These are the moments when there is time for a thriller which makes us forget ourselves our environment and everything but I confess that I never developed a taste for them unless they had real literary value.

What then should the physician read? Quite generally I may say he should read what other educated people read There are no belles-lettres for physicians and others for bankers I think it is a very good habit to begin the day with a poem Most busy people and physicians are busy people, wake up in the morning when the alarm clock rings without being quite rested. Or they have taken a tablet in order to sleep have slept deeply but still do not feel quite normal When they shave they remember what a heavy schedule they have ahead of them and wonder how they will survive the day When they come down to breakfast they already feel gloomy They open the paper and read that everybody hates everybody else. In this state of mind they go to the office and the day s drudgery begins. Why not set the alarm clock 10 minutes earlier and before getting up read a poem or two? It will resound in you through the day and may change your entire outlook This morning I hap-

pened to have Dante Gabriel Rossetti's poems on my table. I opened the book at random and read

> The blessed damozel leaned out
> From the golden bar of Heaven
> Her eyes were deeper than the depth
> Of waters stilled at even,
> She had three lilies in her hand,
> And the stars in her hair were seven.

After I had read the poem I knew that the day was going to be a good one and indeed I wrote more than five pages without inhibitions and whenever something seemed to go wrong I saw the blessed damozel with her lilies and stars, she bowed herself and stooped Out of the circling charm Until her bosom must have made The bar she leaned on warm And I remembered the music Debussy wrote to the poem. He was in Rome at that time, laureate of the Rome prize residing at Villa Medici. He was not happy there although he liked roaming through the eternal city and browsing in the numerous antique shops But he missed his native Paris and every year he had to send to the Paris Conservatory of Music a cantata. He hated doing it to order but La Damoiselle Elue was one, written in 1887 when he was 25 years old and already it had all the infinite charm that France's great coming composer was going to have I have the music on very good records, played them, and thus due to a few verses read in the early morning I had a perfect day during which I did more work than ever

Another day I woke up and heard the rain pouring down. It was not dramatic rain with clouds piling up behind the hills as for a scene in a Wagnerian opera. The world was in grey and it was going to rain steadily for 24 hours. I have a small but select library next to my bed I took out volume of the poems of Paul Verlaine, read

> Il pleure dans mon coeur
> Comme il pleut sur la ville
> Quelle est cette langueur
> Qui pénètre mon coeur?

Again I remembered the music that Debussy had written to these lines and again a day which might have been one of gloom became a festive and most productive day in spite of the monotony of the pouring rain

I think another bit of sound advice is that one should never read the newspapers and magazines before having read t least 50 pages of a worthwhile book Of course we must read newspapers because as citizens of democratic countries we must keep informed of world affairs. I read t least five papers every day in four languages but I find that not more than half an hour is needed to get all the news we are inter ested in Most articles are a mere repetition of the headline, and once you know the event and the party line of the paper you need not read the editorials either They are given and you could write them yourself just as well. The same applies more or less to journals and while we obviously cannot ignore them we should not spend too much time on them.

What then shall the physician read? Any good book written during the last

5,000 years It is a great mistake to read only new books Of course we want to know what is being written today in various countries, how contemporary writers see and recreate the world of which we are a part. Many such new books turn out to be very poor in spite of much publicity and large editions. At least one half of the new books I read are not worth the time spent on them. We fare more safely with the classics, books that have stood the test of time. Apart from my professional reading which obviously is quite extensive, I read about 100 books a year and I keep a record of them. At the end of the year I find invariably that one-third were books written before 1900 many of them before 1500, one-third were written be tween 1900 and 1940, and one-third were new books many of them copies presented by their authors.

There is much talk in America today about The Great Books, the hundred great books of St. John s College the great books published not so long ago in new editions and translations under the auspices of the University of Chicago Clubs have been organized in many cities where people from all walks of life come together to read and discuss the works of Plato Thomas Aquinas, Descartes, and other great writers of the past who have left such a deep imprint on Western thought. This certainly is a development about which we can only rejoice as it means that America is coming of age I know of many businessmen and also physicians who are attend ing the meetings of these clubs and I think it would be very interesting to find out after about 10 years what effect the study of these books has had on them. Has it changed their general outlook their attitude towards life and the world at large, have their actions become different? This is extremely important because the ideo-logic conflict of our time is not one between political and economic theories but between materialism and spiritualism. I cannot discuss this point in any detail as it would require another essay I may only say that in my opinion the ideologic conflict between West and East is not one between the United States and Russia but rather between the United States and Russia on one side and India and other Asian countries on the other side.

The study of the great thinkers of the past undoubtedly is very important as it will help us to acquire a more correct sense of values. It will teach us that the ac cumulation of technical gadgets and material goods in general is of no importance that it is better to be wise than to be rich that there is no point in being the wealthiest corpse in the cemetery It will teach us that freedom is a matter of the individual and has very little to do with political institutions You are free when you are free from material needs and free from passions A man whose heart is full of ambition and hatred is a slave even if he lives in the so-called free world "

One should begin early with the reading of the world s classics. I read hundreds of them in the formative years from 12 to 25 and I have kept reading and rereading them to the present day I have a small library of about 500 volumes next to my bed books from 11 countries and in many languages. They are the books that have accompanied me through life and that I would not like to miss Greek and Chinese classics German and Indian philosophers Russians from Gogol to Chekhov the French classics the *Don Quixote* Goethe, Stefan George and Rilke and of course the great English poets books on music particularly on Mozart and Debussy and

books on art, ancient Egyptian, Babylonian and Arabic poetry the works of some great naturalists such as Alexander von Humboldt and Charles Darwin. It is a small section of my library but one carefully selected, that I love, and it is my daily or rather nightly delight.

To us who grew up in Europe in the beginning of the century it was so easy to get hold of the great classics of the world. In Germany Reclam s Universal-Bibliothek offered practically everything one could wish for for a few cents not only the Greek and Latin and later European classics but the main literature of the Arabs, Persians Indians, and Chinese. Many of these books could be got from slot machines in rail way stations France had innumerable series of classics of the world s literature which were sold very cheaply and in England we had the Everyman s Library the Wisdom of the East series and many others which provided students with excellent texts for very little money

One point I should like to mention in this connection is the speed of reading I know that American schools try to teach their students to read as quickly as possible I have a daughter in America who reads a book in one day which it would take me four to five days to read. If the physician can devote only two hours a day to read ing it is obviously important for him to be able to read much in a short time. I am a hopelessly slow reader and therefore probably prejudiced in the matter When I read a book and a paragraph strikes me as particularly good I may read it several times and make notes about it. I wonder if studies have been made with quick readers to find out how much they remembered of what had particularly impressed them in a book, after five, 10 or 15 years. Some books we wish to forget as soon as possible as they are not worth being remembered, but others we want to assimilate, want them to become part of ourselves, and this takes a certain time.

Many of those who have had the patience to read this essay to the end will think that I am a hopelessly pedantic schoolmaster Maybe I am, but what I wrote I have lived and it has enriched my life so tremendously that I thought that others might benefit from my experience.

How Not to Write a Medical Paper

Hans Selye M.D. Ph.D. D.Sc., D.Sc. (Hon.), F.R.S. (C) F.I.C.S. (Hon.)

PROFESSOR AND DIRECTOR, INSTITUT DE MÉDECINE ET DE
CHIRURGIE EXPÉRIMENTALES, UNIVERSITÉ DE MONTRÉAL
MONTREAL, CANADA

When I received Dr. Félix Martí-Ibáñez flattering invitation to prepare an article for this Symposium, I must admit that, at first, I doubted my competence to do so. However, when I was just about to give up, my secretary, Miss Dussault, handed me a memorandum calculated to raise my courage. From this note, it appears that I have so far written a total of 602 papers[1] and 10 books,[2-11] which appeared (as originals or after translation) in Danish,[12] English,[3] French,[13] German,[14] Hungarian,[15] Interlingua,[16] Italian,[7] Japanese,[18] Portuguese,[19] Russian,[20] Serbian,[21] and Spanish.[22] Surely, I have had enough experience!

But what special aspect of medical writing could I take up?

SELECTION OF TOPIC

After perusing the list of distinguished authors called upon to discuss "The Art of Medical Writing" here, I immediately realized, of course, that, to hold up my own, I would have to select an aspect in which I myself have been successful. I would not like to be accused of immodest exaggeration, but it seems to me that I did succeed in acquiring a rather widely recognized reputation in the domain outlined by my title; it was only natural, therefore, that I should select it as the topic of my contribution to this Symposium.

In fact, looking back upon my activities during all these years, I seem to have exploited every possibility offered by this approach to medical writing, all the way between the telegram-style description of a simple observation to the endless encyclopedia or "Handbuch." Thus, if I wrote an exhaustive treatise along these lines, I could document each point by scientific works of my own. This procedure tempted me also because it would make it possible to demonstrate in practice the soundness of one of the fundamental rules in the art of "How Not to Write Medical Papers," namely, always to quote only one's own publications.

SUBDIVISION OF MATERIAL

It is generally recognized that the subdivision of scientific material into clearly separated "watertight compartments" is inadmissible because actually there are always transitions between everything and everything else. Any attempt at a subdivision is likely to stimulate some shrewd critic to point out your error with considerable sarcasm, recommending that the orderliness and clarity of the classification be abolished so as to restore the original vagueness, the laws of which (being inexistent) are unassailable.

It would, therefore, be quite consonant with the laws of how not to write if I

strictly subdivided my personal treasury of medical literature into the following 13 sections:

(1) How not to write a *telegram-style* description of a simple observation [23]
(2) How not to write a brief *summary for the proceedings* of a society before which you are to speak [24]
(3) How not to write *a letter to the editor* [5]
(4) How not to write an ordinary *original scientific article,* [24]
(5) How not to have a *lecture series* published [7, 11]
(6) How not to write *articles for journals subsidized by the pharmaceutical industry* [17, 18]
(7) How not to write texts for presentation over *radio or television* networks [20]
(8) How not to write a *review* article [20]
(9) How not to write a *medical textbook,* [4]
(10) How not to write an exhaustive *monograph,* [1]
(11) How not to write *yearbooks,* [4–6]
(12) How not to have your *books translated,* [13–15]
(13) How not to write an *encyclopedia* [6, 1]

However as I proceeded to fill in the subheadings for each of these parts my sketch turned into a plan for an encyclopedia in 13 volumes That was not exactly what the editor asked me to prepare, so I had to pick out a more limited subject. I selected from the projected volume 4 (original papers), the chapter in which I was to deal with the evaluation of data, because it is on the interpretation of original observations that the progress of understanding depends most immediately

DISCUSSION AND EVALUATION OF DATA

GENERAL CONSIDERATIONS

To what extent is the discussion and evaluation of scientific data justified? Many contemporary medical authors frown upon any discussion and evaluation of data which goes beyond a mere synopsis of the facts obtained and an appraisal of their statistical significance. Is this to be recommended?

It is undoubtedly improper to discuss theoretic implications of scientific results in those sections of an original paper which deal with the description of the data (" Materials and Methods, Results "), because this can lead to confusion between what the author observed and what he thinks On the other hand, in the introduction, which is meant to outline the purpose of the investigation, and in the section specifically entitled Discussion, some such interpretative remarks are, in my opinion, virtually an obligation to the reader

Let us never forget that science is not the mere cataloguing of observed facts, but accumulated knowledge, systematized and formulated with reference to the discovery of general truths or the operation of general laws Only the most epoch-making discoveries would necessitate no such justification of the experiments which led to them, or appraisal of their significance. The discovery of a drug which would cure cancer with absolute certainty might be considered a case in point. Even here,

cortical properties. It is on this basis that we actually [illegible] grams of aldosterone available to us for this, rather than [illegible] other actions it might have possessed. In agreement [illegible] terone was found to be a potent antagonist of the [illegible] successive application of both these steps in reasoning was [illegible] the corticoid antagonism theory and then to verify whether [illegible] ocorticoid would behave as predicted by this concept [illegible]
Nothing but a similar combination of inductive and deductive [illegible] led us even to postulate a relationship between corticoids and [illegible] diseases merely on the basis of experiments with DCA [illegible] years before the first rheumatic patient received cortisone.

Both deductive and inductive reasoning have definite limitations [illegible] the limiting factor is the same for both The smaller the number of [illegible] observations, the greater the danger that generalizations made [illegible] hold true This limits inductive and deductive reasoning to the [illegible] the at first unconnected, observations are gradually arranged into a [illegible] induction and deduction follow each other and depend upon each other [illegible] like consecutive steps with the left and the right foot in a walk. It would [illegible] false to attribute greater importance to one or the other

Those who object to inductive reasoning do not realise that what they [illegible] deplore is the unwarranted confidence in a general law To insist [illegible] eralization must be based on as many observations as possible; however, [illegible] lated on the basis of a given number of data, it is no more nor less likely [illegible] as a general law than as a guide permitting correct deductions in [illegible] instances Of course such deductions cannot be accepted as equivalent [illegible] their immense value lies merely in singling out among the infinite number of pos- sible experiments those few which are worth doing

To those accustomed to abstract thinking, these considerations may seem [illegible] and superfluous, but perusal of the medical literature shows that in practice [illegible] points are very frequently overlooked.

The coining of technical terms Finally to conclude this introductory [illegible] say a few words about the development of the technical language which we [illegible] use in describing our results Actually as we shall see, the problem of [illegible] terminology is quite closely related to the preceding discussion on induction and deductive reasoning

Naturally every newly observed material or conceptual entity must be [illegible] it would be impossible to redefine it, through an exhaustive description of its [illegible] characteristics, each time we wish to refer to it in a sentence. Although [illegible] rather self-evident, there exists a deep-rooted and widespread aversion to the [illegible] neologisms. Those authors who never had any occasion to learn a foreign language find it especially difficult to get used to new terms, which frequently strike them [illegible] ridiculous merely because of their novelty or as fancy because in medicine [illegible] of them have Greco-Latin roots.

It is undoubtedly true, of course, that the coining of a new term can create [illegible] confusion. Having been responsible for quite a few of them (both terms and [illegible]

fusions) myself I am well aware of this and, in the next section of this paper "The Seven Traps" (trap no 5), I plan to deal at some length with one, especially common source of misunderstanding created by certain new class names. Here we may limit ourselves to some general considerations which must be kept in mind whenever any kind of new term is to be introduced into the medical literature.

Firstly we must ask ourselves whether a new term is really indispensable A great deal of the legitimate aversion against neologisms is due to the fact that authors have often introduced them merely to leave their personal imprint on a subject which did not need to receive a special name. The innumerable clinical syndromes which represent minor modifications of other well-known conditions illustrate this point. For instance if a disease, hitherto characterized by four cardinal symptoms is now observed in a number of patients where it occurs in association with a fifth symptom, it is rarely justified to rename it.

Even if a concept is sufficiently new to deserve a new designation, the latter should as far as possible, be *self-explanatory* rather than represent an arbitrarily chosen association of letters or the name of the discoverer It is also important to keep in mind that medical terms should be understandable to foreign authors and easy to translate into foreign languages This is best accomplished by using only terms of Greco-Latin derivation for the designation of biologic topics

If we follow all these rules we immediately run into the difficulty that *the term we chose has usually been employed before in a slightly different sense* This may create some confusion, but I do not think we need to worry about it too much If the suggested new use is clearly defined an overlap in terminology is not likely to be misleading

For instance, we proposed the term *conditioning for hormone actions* in referring to the fulfilment of all those conditions which are necessary for a hormone to exert its effects This term might conceivably be criticized on the grounds that Pavlov spoke of conditioned reflexes in an altogether different sense but anyone familiar with these subjects is unlikely to be misled Such common and useful terms as conditioned and conditioning would be difficult to avoid it is precisely for this reason these words are so often used and sometimes in an even more fundamentally different sense (e g air conditioning) In a case like this the advantage of a self-explanatory term designation (easily translated into any language by just appropriately changing the Latin root) greatly outweighs the far-fetched possibility of a misunderstanding

I encountered much more opposition to my use of the words stress and stressor to designate "the sum of all nonspecific changes caused by function or damage and the agent which elicits such changes. It had been pointed out that stress had already been used in physics in a somewhat different sense it is also currently employed in conversational English in connection with almost anything that represents a strain. However the fact that the term was so rapidly and generally accepted in its new strictly defined biologic sense makes it very dubious whether another designation would have been equally satisfactory

Yet, I do feel that it was a great mistake not to select a term of Greco-Latin derivation. Unfortunately in 1935, when I began my work on stress I just did not think

of the problems which translation into foreign languages might raise. The result was that some French authors used such words as *stimulation* (stimulation) or *agression* (aggression), Germans spoke of *Anstrengung* (effort) or *Schaden* (damage), and the Spanish edition of my own monograph *Stress* was printed, much to my surprise, with the subtitle "sufrimiento" (suffering). All of these terms, of course, have entirely different connotations. Fortunately it has now become customary in all languages to use the word "stress" in its present sense, without any effort to translate it. Had we thought of using a term derived from Greek or Latin, all this confusion could have been avoided. Actually I learned later that, as usual, the Greeks had a word for it. "Ponos" corresponds almost exactly to "stress" and could have been used in this sense, but now the English designation is far too generally in use to warrant any change.

Some years ago I proposed the term "corticoid" (derived from "adrenal cortex" and the Greek suffix "oid," meaning "similar to") as a class name for "those hormones which imitate the physiologic function of the adrenal cortex." For this I have been reprimanded on the more general grounds that "... the invention of technical terms by those not born in the language is very dangerous ..." I tried to point out in my feeble defense[23] that it would greatly handicap the progress of science if only those who could call both Latin and Greek their native tongues were considered competent to coin Greco-Latin technical terms. But actually I understood the implication.

One last warning which may be in order in this section on terminology is to observe, as much as possible, a *uniformity in the terms* referring to related topics. This is particularly important when it comes to teaching a subject.

For instance, it is easy to explain to our students that ACTH is the abbreviation for the adrenocorticotrophic hormone, just as LTH is the luteotrophic hormone, but when it comes to TSH for the thyrotrophic hormone, we run into difficulty. Of course, we can overcome this, in part, by calling attention to the fact that this principle had first been designated as the "thyroid stimulating hormone," but the student begins to wonder whether there is any fundamental difference between the trophic and the stimulating hormones of the pituitary. In any case, it is not apparent why in recent papers in which the authors usually speak of thyrotrophic hormone, they nevertheless use the abbreviation "TSH," when "TTH" would be so much more understandable.

The "growth hormone" furnishes us with an even better example demonstrating how important these apparently insignificant terminological considerations can be. In English literature, the most current abbreviation of "growth hormone, GH," was self-explanatory, but when an English-speaking investigator tried to work his way through the foreign literature he ran across the abbreviations WH (Wachstums-hormon) in German, HC (Hormone de Croissance) in French, and RH (Rustovy hormone) in Czech, the meaning of which was far from evident to him at first sight. There was also much confusion with the "growth hormones" of plants and bacteria.

The "growth hormone" had been discovered, more than a quarter of a century ago, by H. M. Evans, and most of its fundamental properties on growth and C... phenomena had been adequately studied by numerous investigators. Our only ...

tribution to this field was the demonstration that growth hormone does not produce growth under all circumstances, while, on the other hand, it can exert actions quite independent of growth in length, due to its powerful effect upon connective-tissue reactions, particularly inflammation. Nevertheless, the abbreviation we suggested STH (for the term somatotrophic hormone ") was immediately accepted by a large number of investigators throughout the world. This was hardly due to the importance of our research with STH, but to the fact that the term (being of Greek derivation) was readily understandable to workers of all language groups and corresponded to the general trend of naming trophic hormones by designations ending in TH

But now let us turn to what strikes me as the most important point in connection with the evaluation of technical research data, namely how to avoid the traps that nature continuously puts in our way when we attempt to reveal her secrets

THE SEVEN TRAPS

(A Disquisition on Common Fallacies in Scientific Research)

As soon as we attempt to derive any general conclusions from specific individual data we are likely to be caught in what might be designated as traps of reasoning Their number and variety are virtually infinite, but having been personally caught in almost every one of them I feel quite at home in this field Let me therefore take this opportunity to analyze at least a few of those traps whose mechanism of action I managed to disentangle so that I am less likely to be caught by them again and may perhaps also save some others from a similar humiliating experience.

Trap No 1 The Intersecting-Dose Effect Curves

In endocrinology it is widely accepted as axiomatic that if a crude glandular extract can be partitioned into two fractions having qualitatively different effects this constitutes a proof that it originally contained two chemically distinct active principles and that these have now been totally or partially separated from each other

In the case of glands which produce several hormones, such as the pituitary and the placenta, this axiom has been and still is the basis of every discussion concerning the alleged discovery of new humoral principles. Yet, it is false.

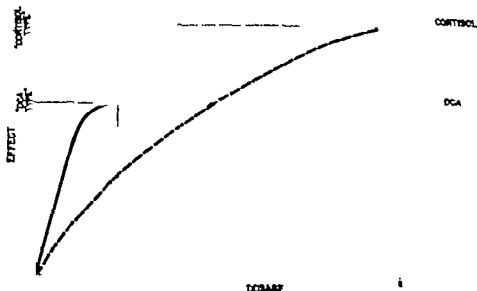
If we prepare a solution containing a fixed proportion (say 1:1) of two chemically pure hormones which pharmacologically antagonize each other we may obtain qualitatively different (indeed sometimes diametrically opposite) effects with the same solution at low and at high dose levels

It had long been known for instance, that in the spayed rat a folliculoid compound (*e g estradiol*) *causes cornification, while a luteoid* (*e.g progesterone*) produces mucification of the vagina When low doses of estradiol just sufficient to cause vaginal cornification, are given conjointly with high doses of progesterone, the cornifying effect of the former is totally abolished by the latter steroid and the vagina becomes mucified *It is possible, however* to prepare a solution containing a mixture of estradiol and progesterone which at low dose levels causes cornification,

at high dose levels, mucification.[8] Of course, in all experiments of this kind we must first remove the gland which normally produces the hormones we want to calibrate against each other Otherwise unknown quantities of endogenously secreted hormones would complicate the outcome.

Let us take another example from a totally different field of endocrinology It is well known that, in an adrenalectomized rat, an experimentally produced inflammation (e.g., a granuloma pouch) can be inhibited by cortisol, and that this inhibition can, in turn, be blocked by desoxycorticosterone acetate (DCA). It is possible, however to prepare a mixture (containing both these hormones in a fixed proportion) of which small amounts stimulate, while large amounts inhibit inflammation. Indeed if we now take this solution and dilute part of it, the prophlogistic effect of the dilute portion *can be antagonized* by the simultaneous administration of the more concentrated original solution.

This phenomenon has been explained by the law of the intersecting dose-effect curves [11] and its mechanism is illustrated by the example of the DCA-cortisol antagonism.



We note that the effect of DCA rises very sharply but rapidly reaches a plateau at dose level 1." On the other hand the effect of cortisol increases more slowly but *eventually reaches a much higher plateau* at dose 2.

This interpretation also fits the above mentioned antagonism between estradiol and progesterone, since folliculoids produce vaginal cornification at very low dose levels, but by further increasing the amount, above the quantity necessary for total cornification, it is difficult to produce any detectable additional change. On the other hand, progesterone has no detectable estradiol-antagonizing property at low

dose levels, but its effect becomes increasingly more evident as the dose is raised

It is important to keep in mind that the law of the intersecting dose effect curves does not deal with mutual chemical neutralization between two compounds, but with antagonistic interrelationships between two pharmacologic activities. This is why it can manifest itself even when different doses of a single compound are given, as long as the latter possesses two independent and potentially antagonistic pharmacologic properties.

Testosterone is a case in point, since this steroid produces vaginal cornification at low and mucification at high dose levels

From what I have said so far the reader might gain the impression that the phenomenon of the intersecting dose-effect curves could be misleading only when one preparation possesses pharmacologic properties diametrically opposite to those of another preparation Actually this phenomenon can even create qualitatively new effects

It must be remembered, for instance that in the example of the corticoids neither the pro-inflammatory nor the anti-inflammatory effect is evident at the point of intersection, so that here this action is selectively removed from the total picture. Other properties of DCA and cortisol are not mutually antagonistic (e.g the liver-glycogen-depositing effect of cortisol is not depressed by DCA at any dose level on the above curve) and yet other effects (e g the life-maintaining power of the corticoids in adrenal insufficiency) are actually synergistic. It is easy to see how an investigator furnished with several vials containing these two steroids in the same fixed proportion but at different dilutions, could come to the conclusion that each vial contains altogether different hormones in a pure state or at least, different proportions of several hormones.

I discussed the phenomenon of the intersecting dose-effect curves at some length and assigned it the first position among the fallacies to be considered here, mainly because it represents a particularly common error of reasoning in my own field of endocrinology and stress research. However I believe that it also is the basis of much misunderstanding in other fields.

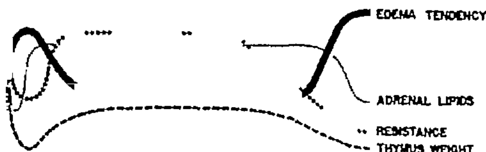
On the other hand I should not like to finish this chapter without pointing out that, despite all that has been said, separation of a crude extract into two fractions with pharmacologically distinct properties is an important and significant step. It furnishes a very legitimate reason for believing that the crude material *may* contain two principles which could be separated from each other The important point to remember is that such a separation merely furnishes us with a logical reason for suspecting the presence of several hormones thus it justifies further chemical work to attempt their isolation. Yet, it is only after the isolation has been accomplished that we can speak of a proof

Trap No 2 The Dissociated Time-Effect Curves

A rather similar kind of problem arises when the various actions of the same agent do not manifest themselves at the same time

Thus for instance in the course of our studies on the general adaptation syn-

drome, it was noted that the transition between its three typical stages (the alarm reaction the stage of resistance, and the stage of exhaustion) is not sharp. Often there is some dissociation in the manifestations, with certain signs of two stages simultaneously in evidence This is so no matter what stressor agent is used to elicit the syndrome, and we may therefore take the following schematic drawing as an illustration of dissociated time-effect curves during stress in general



Here the edema-tendency the adrenal lipids resistance to stress, and thymus-weight (given as illustrative examples selected at random) do not traverse simultaneously from the alarm reaction to the resistant stage and subsequently to the stage of exhaustion. This has been ascribed to different degrees of inertia in the various targets affected by stress.

It is evident that if any agent produces such dissociated time-effect curves in different targets, the over-all pattern of response may be totally different in two experiments, merely because they have been terminated and analyzed at different times. Of course the development of the whole syndrome at a given time also depends upon a variety of other factors, which are not always easy to control or even to recognize (e.g., state of nutrition, dosage and speed of absorption of an injected stressor substance, *influence of uncontrollable contaminants, surrounding temperature*).

It is easy to see how such dissociated time-effect curves can also create the erroneous impression that we are dealing with two agents possessing pharmacologically different activities. For instance, when we test two concentrations of the same stressor agent at a given time of observation, adaptation to the lower dose (stage of resistance) may already have recurred when the stronger dose still produces the acute reaction pattern.

We could cite many interesting examples of studies in which this chronology trap has caused considerable confusion but let us merely mention one variant with which I myself had a most curious experience.

I shall always remember the occasion when, some 15 years ago we studied the effects of large doses of progesterone upon the mammary gland. After I had performed several preliminary tests in which marked mammary proliferation was obtained in rats given 20 mg /day of progesterone, I had asked a technician (who was quite experienced and undoubtedly reliable but new to our laboratory) to carry out some additional experiments along these lines She reported a few days later that this dose of progesterone invariably killed all her rats. This I found difficult to understand since progesterone never caused any sign of damage in all my previous experiments on rats.

I checked the progesterone solutions very carefully but could not find any explanation for these unusual results. I then asked this technician to inject the animals in my presence and found that she administered the hormone intraperitoneally because, in all her previous experiments with other drugs, this happened to be the recommended technique Of course in our Institute we had always injected progesterone subcutaneously (the usual way of administering sex hormones to rats) and it just never occurred to me even to mention this point.

As we were discussing this and watching the rats she injected they went to sleep before our eyes The technician had missed this stage of anesthesia since there was no reason for her to follow the behavior of the animals immediately after each injection, in a chronic experiment on breast development.

Systematic studies along these lines have subsequently revealed that the anesthetic effect of progesterone (as that of other steroids) depends upon a rapid flooding of the organism with the hormone and hence anesthesia develops only after intraperitoneal or intravenous injections It never occurs following subcutaneous administration of steroids at any reasonable dose level, because the absorption rate from the connective tissue is too slow

This is actually how the anesthetic effect of steroids was discovered [14] Thus here perchance the error proved to be most useful but it also strikingly demonstrated the importance of watching for the "chronology trap.

Trap No 3 What Is Not There Cannot Act

At first sight it appears to be a self-evident fact that an agent which is not there cannot act. Actually this assumption has led to innumerable errors in interpretation some of which have become classic in the history of medicine.

It will be recalled that, during the earliest stages of the development of modern bacteriology Robert Koch formulated his famous postulates outlining the conditions which must be fulfilled before a disease can be ascribed to the actions of a microorganism. The first and most essential postulate of this kind was that the microbe must be demonstrable in every case of the disease

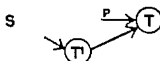
In the words of Koch translated by Watson Cheyne A thoroughly satisfactory proof (of the parasitic nature of a disease) can only be (obtained) when we have

succeeded in finding the parasitic microorganisms in all cases of the disease in question, when we can further demonstrate their presence in such numbers and distribution that all the symptoms of the disease may thus find their explanation and finally when we have established the existence for every individual infective disease of a microorganism with well-marked morphologic characters.

Actually subsequent work has shown that, in many instances, the manifestations of a microbial disease are present only after the microbe is no longer demonstrable. Indeed, in some cases (botulinus toxin) it may occur in individuals who were never *infected with the microbe itself* but *merely ingested material* containing toxins of the microorganism. Conversely highly pathogenic microbes may be present in healthy carriers.

The so-called metacorticoid lesions are another case in point. Suitably sensitized rats, treated with large doses of DCA for a comparatively short period may manifest no evidence of nephrosclerosis, hypertension or periarteritis nodosa during the hormone treatment or even immediately after its interruption, but weeks or months following discontinuation of the DCA treatment they will develop all these changes. Thus here again the effect is manifest although the original cause is not present in the body

The principle of trap no 3 may be illustrated by the following drawing



Here, the stimulus S can act upon the target T through the direct pathway P The resulting change may not have been manifest while the stimulus was actually present in the organism, but its results are nevertheless the consequence of this action. (This eventuality was not covered by Koch s postulates.) On the other hand, the stimulus S can act upon the target T^1 and cause delayed changes in it, which secondarily affect the target T at a time when the original stimulus is no longer present. (This is apparently the explanation of the metacorticoid vascular lesions secondary to delayed nephrosclerosis.)

There are of course, innumerable additional examples illustrating this point. For instance, the delayed effects of peritoneal scar formation, the pathogenic consequences of anaphylactic sensitization the late results of emotional experiences which occurred in early infancy and indeed, every experience which leaves a potentially traumatic memory in the broadest sense of this word.

Now in retrospect the causal *relationship between all these stimuli* and their delayed effects is so clear that it may seem superfluous to mention this source of error However as we have seen medical history shows that, in practice, the axiom

what is not there cannot act is so generally considered to be evident as to mislead even a Robert Koch.

Trap No 4 The Three Fallacies of the Alternative Pathways

A great many errors in the interpretation of scientific data result from the most pernicious tendency constantly to overlook the possibility of multiple alternative routes of impulse-transmission. The pathways between stimulus and target may not only be direct or relayed through an intermediate station but very often several alternative pathways exist, and then blocking any one does not necessarily prevent a target from responding to the stimulus. Conversely the successful blocking of a response does not necessarily prove an interference with the pathways of transmission it may be due to the removal of an indispensable conditioning factor required for responsiveness at the level of the target itself

A The rôle of the relay station Let us assume that it has been shown by actual observation that both the stimulus *S* and the hormone of an endocrine gland *T* can act on a target T^1 It seems rather obvious that, in this event, the theory which holds that *only* *T* can act on T^1 is necessarily false.

If the problem happens to present itself in this formulation, it is very tempting to consider the above statement as self-evident. Yet it overlooks the possibility of complications due to a relayed effect through *T* Although any endocrinologist knows of course that all the final effects of glandulotrophic pituitary hormones are thus mediated the error is quite common, in actual practice.

The falsehood of the above apparently unchallengeable axiom is immediately evident from the following schema



It is clear that although in such an arrangement, *S* can act on T^1 it is equally true that nevertheless *only* *T* can act on T^1 because even *S* affects the final target only through this intermediate station.

In this Institute we ran into this problem in connection with the production of nephrosclerosis with methylandrostenediol (MAD). I had previously shown in systematic experiments with several hundred steroids that only those endowed with mineralocorticoid activity produce nephrosclerosis and hence, it seemed justified to arrive at the generalization that the nephrosclerotic action is closely related to the mineralocorticoid effect.

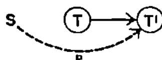
Then one of my former students (Floyd Skelton) published a most interesting paper in which he showed that MAD also produces nephrosclerosis This compound is a testoid or androgen It certainly possesses no mineralocorticoid properties indeed, t has no corticoid activity at all Even chemically it is quite different from all cortical hormones

This puzzled us for quite some time until (in collaboration with Ernesto Salgado) we noted that MAD has no nephrosclerotic action in adrenalectomized rats although its testoid activities (stimulation of the male accessory sex organs) remain uninfluenced by adrenalectomy

It thus became evident that, although adrenalectomy does not interfere in any way with the activities characteristic of this steroid itself, it prevents the compound from producing nephrosclerosis This is presumably so because the steroid exerts this latter effect through the induction of some metabolic error in the adrenal cortex itself so that the cortical cells produce predominantly mineralocorticoid-like hormones.

B The alternative pathways Another modification of this same fallacy is due to the phenomenon known in endocrinology as the conditioning of hormone actions. We have already mentioned it in connection with the coining of technical terms. Here, the typical reasoning is the following If a stimulus S acts on a target T^1 only in the presence of an endocrine gland T then it is highly probable that S acts on T^1 through T If it can subsequently be shown that hormones of T act on T^1 (in the *same sense as S acts on T^1 in the presence of T), then it may be taken as* virtually certain that S acts on T^1 through the intermediary of T (As depicted in the previous schema.)

This conclusion is also false, as shown by the following drawing



It is evident that under such circumstances, S may act on T^1 directly through the pathway P but the effect of P can become manifest only in the presence of the hormones of T In this case we say that P conditions for the hormonal actions of T but is ineffective in itself.

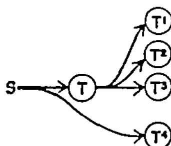
The study of the corticoids has given us innumerable examples of this type of relationship (cf. Fourth Annual Report on Stress [5]). For instance, in the adrenalectomized rat, treatment with a stressor agent (e.g formalin, cold) does not cause acute accidental thymus involution, while in the intact rat the same dose of the same stressors produces intense thymolysis. On the other hand, cortisol induces thymus involution even in the adrenalectomized rat, and subthreshold doses of cortisol (which would be in themselves ineffective) can be rendered effective by simultaneous treatment with stressors even in the absence of the adrenals. In a case like this, we may say that the stressors conditioned the target (thymus) favorably as regards its reactivity to cortisol. Virtually the same interaction between stressors and cortisol has been demonstrated to hold true for the catabolic, antiphlogistic, and many other effects of this steroid.

There are also several modifications of this type of interaction. For instance, a certain response of T^1 (in the above diagram) may not occur under the influence of

the hormones of *T* nor under the influence of the stimulus *S* if the gland *T* is absent. In such cases the response may still be obtained if both the hormones of *T* and the stimulus *S* act simultaneously

A pertinent example which has come up in the course of my own work on corticoids is the production of nephrosclerosis with DCA. In a normal rat, kept on a low sodium diet, it is virtually impossible to produce nephrosclerosis with DCA Conversely it is also impossible to produce nephrosclerosis with sodium chloride under these conditions. On the other hand, simultaneous treatment with DCA and dietary sodium chloride supplements invariably produces intense nephrosclerosis.

C. The branching pathways The general principle of the most common fallacy occasioned by a branching of the pathways between stimulus and target is illustrated by the next drawing



Supposing that when the actions of the stimulus *S* are first submitted to scientific study all the initial investigations happen to be concerned with its effect on T^1 T^2 and T^3

Much effort is devoted to determining exactly how *S* acts and eventually it can be definitely established for each of these targets that all actions are mediated through the relay point *T* As years go by it becomes classic textbook knowledge that *S* can act only through *T* If it is now discovered that *S* also acts on the target T^4 the temptation is very great to assume that here again the action was mediated through the same relay point. Actually *S* could still exert this effect directly (as indicated in the drawing) or through some relay station other than *T* but by now there is a psychologic block for even considering this

We ran across this particular problem in connection with our work on the direct actions of ACTH preparations

At the time we began to study these it was generally admitted that ACTH acts merely by stimulating the corticoid production of the adrenals, since all its known effects could be abolished by adrenalectomy It then turned out that even the most purified ACTH preparations available at the present time stimulate the preputial glands of the rat. These structures, being accessory sex organs are considered to be normally under the dependence of the gonads Hence, we repeated our work on gonadectomized animals to check a possible transgonadal mediation. No such action could be demonstrated and hence we silently assumed that we must be dealing

with an ordinary that is, adrenal-mediated effect of ACTH itself [illegible] action due to contaminating gonadotrophic substances

It took us some time before we realized the necessity of verifying which particular action of ACTH is actually dependent upon the presence of the [illegible] When finally the experiments were repeated on adrenalectomized [illegible] that, curiously the preputial gland-stimulating effect was not abolished [illegible] all other known actions of the hormone were eliminated by this operation. [illegible] we proved that ACTH itself (or some principle present even in the [illegible] ACTH preparations) possesses an extra-adrenal direct effect.[14]

Here again in retrospect it would seem elementary to check adrenal [illegible] However in fact, among the many publications describing the [illegible] stimulating effect of ACTH before us, not one reported any data on adrenalectomized animals. It was considered so self-evident that ACTH could only act through stimulation of corticoid production that other possibilities just did not come to mind

I committed the same error again in connection with the production of nephrosclerosis by large doses of somatrophic hormone (STH). It had been [illegible] established by innumerable observations, that STH does not act through the adrenal upon the growth of any tissue previously examined When it was then [illegible] that, in suitably sensitized rats, large doses of STH can produce nephrosclerosis the question of a possible adrenal mediation did not even arise in my mind for some time However when eventually we came to consider this possibility [illegible] found that, in adrenalectomized animals, STH does not cause nephrosclerosis at any dose level. Even therapy with various corticoids fails to substitute for the missing adrenal in this respect. Apparently the nephrosclerotic action of STH (or of some principle inseparably attached to all available STH preparations) is mediated through the adrenals.

The so-called feedback theory of ACTH secretion during stress which had been so popular even as late as two years ago, was based on this same fallacy

It had first been definitely established that, during the alarm-reaction, the pituitary secretes ACTH which in turn, stimulates corticoid production. Conversely corticoids had been demonstrated to produce compensatory atrophy of the adrenals through diminution of hypophyseal ACTH secretion. Evidently here we are dealing with a "feedback arrangement. In view of all this, it was tempting to assume that during stress ACTH secretion is stimulated through the same mechanism, in that the utilization of corticoids is so much increased that a state of functional hypocorticoidism results. This could then become the stimulus for an increase in ACTH production.

Actually in the alarm reaction there is no factual evidence for an increased utilization of corticoids with a consequent hypocorticoidism, indeed the corticoid concentration in the blood is greatly augmented during stress. We had also demonstrated, more than a decade earlier that even in animals heavily overdosed with various corticoids, stress can still stimulate the adrenal This led us to conclude that the blood-corticoid level regulates ACTH secretion only at non-physiologic levels. It is precisely a prerequisite for a normal stress reaction that this feedback

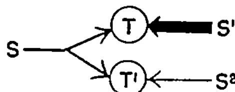
mechanism be, at least partly inactivated otherwise, the characteristic great increase in corticoid-production could not occur (For a discussion of the literature, cf. *Stress* [5]) Nevertheless the psychologic reluctance to accept the existence of alternative pathways was so great that the tissue-utilization and feedback theory remained popular for many years

A rather instructive application of the branching pathways principle came to our attention last year Here, the situation was greatly complicated by the fact that it was not the branching of the pathway between stimulus and target, but the uneven distribution of factors influencing target-responsiveness that led to confusion

Two, completely independent, foci of inflammation (granuloma-pouches) were produced in the same adrenalectomized rat, which was maintained on a medium dose of cortisol Into one of these foci we introduced a high, into the other a low concentration of an irritant (croton oil) Under these conditions the inflammatory focus containing the high concentration of the irritant underwent necrosis because the development of a protective granuloma was insufficient (too much cortisol) the other focus, which contained the lower concentration of irritant, underwent an excessive degree of inflammation, without there being any necrosis (too little cortisol)

Thus the same amount of circulating cortisol resulted in a co-existent hypo- and hypercorticoidism in two foci of inflammation within the same animal. Or to put it into other words a given dose of cortisol may be insufficient to reestablish normalcy in one focus while it is too high for the reestablishment of homeostasis in another location within the same individual.[17]

The principle of these somewhat complex interrelations is illustrated by the following drawing



Here, S is the circulating cortisol S^1 the high concentration, and S^2 the low concentration of croton oil while T and T^1 are the two granuloma-pouches treated with these different concentrations of the irritant. At T there results a relative hypercorticoidism (manifested by necrosis) while at T^1 there is a relative hypocorticoidism (manifested by excessive inflammation)

I believe that there are many applications of this same principle which have not yet received the attention they deserve. We are accustomed to thinking of hypo- and hypercorticoidism as conditions which could never co-exist in the same individual because the cortical hormones are necessarily distributed evenly through the blood stream. With this picture in mind we are ill prepared to think of the eventualities outlined above

It would be well worthwhile to explore further the role such conditions play in clinical medicine For instance in severe diabetes a large amount of cortisol must

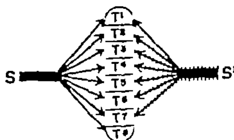
be produced in order to maintain life and combat the stress effect of the metabolic derangement. On the other hand, the rise in cortisol production necessarily aggravates hyperglycemia, glycosuria, and the predisposition for infections Although here there are no circumscribed foci with different corticoid requirements the over all situation is again such that, from a certain point of view there is too much and from another too little cortisol in the body

Trap No 5 The Inflated Authority of a Class Name
(*The "Extrapolation Trap"*)

Evidently there is a certain overlap between the various problems we have considered so far However my purpose in presenting these fallacies is not so much to arrive at their clearcut classification as to present them the way they usually present themselves. We are most likely to avoid such traps in the future if we acquaint ourselves with their manifold camouflages I should therefore like to describe the many ways in which they can actually arise in the laboratory even at the risk of some overlap.

The particular fallacy in thinking which in our laboratory we have come to call the inflated authority of a class name overlaps for instance, with the branching pathways" and the alternative pathways to some extent. Yet I believe it is instructive to reconsider it specifically in relation to the importance of class names because so frequently it is actually a term itself which seems to be the immediate cause of error

Their general principle is illustrated by the following drawing



The whole target (represented here by the rod-shaped central structure) has many characteristics in common That is the only reason why we can refer to it by a single class name, say the T-rod instead of having to enumerate each of its parts from T^1 to T^8 every time we we wish to refer to it. These common characteristics are not necessarily due to an anatomical proximity of the parts they have a purely functional basis (cf. the almost ubiquitous elements of the reticulo-endothelial system).

Such class names are convenient, indeed sometimes indispensable, but they may become misleading Let us assume, for instance, that, in our schematic model, to

investigator first proves by actual observation on seven points that S stimulates (T^1–T^7), while S^1 inhibits (T^2–T^6) the development of the T-rod. Let us assume, furthermore, that by the time he got that far his supply of S^1 is exhausted In a case like this the temptation is great to say that, of course, on T^1 and T^7 the actions of S and S^1 would also mutually neutralize each other The reason for this is that we come to think of S as a single stimulator (solid common part of the arrow at the left) and of S^1 as a single inhibitor (cross-hatched common part of the arrow at the right). Actually when we examine the drawing more closely it turns out that, on T^1 both S and S^1 stimulate, while on T^7 S stimulates but S has no influence in either sense. Here the formulation of the three class names (and concepts) S for *the* stimulator S^1 for *the* inhibitor and T for *the* target, is justifiable and convenient. However these collective designations themselves became the very reason of a psychologic block which prevents us from seeing such exceptions as may occur at individual points (namely at T^1 and T^7)

To take an actual example, the male (primary and secondary) sex organs represent a composite target, which consists of many structurally quite dissimilar tissues (the testis and beard of man, the antlers of the stag the capon s comb etc.). We refer to them by the single class name male sex organs because, despite the diversity of their appearance, function, and site they are characteristically well developed in males and not in females. Furthermore, they are generally stimulated by the testoid male hormones (e.g testosterone) and inhibited by the folliculoid female hormones (e g estradiol) This leads us, in turn to think of a whole group of other substances as stimulators (androsterone methyltestosterone), and inhibitors (estrone estradiol) in this same sense The capon s comb, for instance, is stimulated by testosterone androsterone, and methyltestosterone and inhibited by estradiol estrone and estriol After a similar antagonistic interaction has been established on innumerable other male sex organs the concept of a hormonal antagonism in the genital sphere becomes so firmly established in our mind that exceptions are not readily noticed Yet, the mammary glands of the male rat are stimulated by both types of hormones, while the preputial glands are stimulated by testoids but not inhibited by folliculoids

The discovery of such exceptions invariably induces some critics to question the wisdom of establishing class names for the conjoint consideration of the various parts of a target or for the diverse individual actions of stimuli This criticism is quite unjustified

To take the above example, it would be very awkward to get along without the concept of the male sex organs or of the male hormones despite the exceptional behavior of certain individual components which the class name tends to unite. It would be obviously impossible, for instance, to enumerate every known (and indeed every not yet discovered) male hormone whenever we wish to say that a certain organ is stimulated not only by testosterone, methyltestosterone and androsterone but, as far as we know by all the male hormones. The human brain itself is so constructed that in most of our thinking *we must use symbols* which act as shorthand descriptions for entire classes of related entities Otherwise we would be lost in the mass of details with which we h ve to de l The solution is not to abandon class

names, but to recognize their limitations and to avoid inflating them with an absolute authority which they do not possess. A good class name will serve us well, but only as long as we realize that it refers to similar not to identical things.

In the course of my own work on the adrenal cortex, I had to face a somewhat different problem arising from the misunderstandings likely to be caused by class names. When I proposed the terms "mineralocorticoid" and "glucocorticoid" for the two major classes of the life-maintaining adrenal hormone actions, I took great care to emphasize that the same chemical compound may exhibit both these activities, although generally not to the same extent. The terms were, therefore, meant to designate *actions not chemical compounds*.

Ample experimental data subsequently confirmed the fact that these actions are distinct and, indeed, in many respects actually antagonistic. In practice, it then became customary for the sake of convenience, to refer even to compounds as "mineralocorticoids" or glucocorticoids if their activity was quite predominantly of one or the other type. This is undoubtedy justified and in agreement with common usage in endocrinological terminology. No one would question the wisdom of calling cortisone a corticoid, although it does possess slight virilizing effects (hirsutism) nor would one want to reject the term male hormone" because cortisone also acts this way. Nevertheless, in the intervening years, more than 50 authors, one of them as late as this year [11] claimed that the subdivision between mineralo- and glucocorticoids is not tenable because certain compounds possess both these actions. The virtually unanimous acceptance of our classification by all other investigators demonstrates quite clearly that such class names are useful, if not indispensable, as long as we merely keep in mind that the members of a class are similar but not identical.

Trap No. 6. The "Group-specialist Phenomenon"

This is perhaps the simplest and yet the most common fallacy in the reasoning of medical investigators. It may be illustrated by the following hypothetical case.

Supposing we have five groups of animals each treated in different manner. In only one of these groups is there a striking change in the target organ under examination. In this group, however every individual animal shows this change and there can be no question about the statistical significance of the difference between this and all other groups. Under such circumstances, the experimenter is very likely to conclude without hesitation that the treatment was the cause of the change. The whole of experimental medicine is based upon the principle that if a change occurs only in those individuals receiving a certain treatment, the latter must be regarded as the cause of the change. Here, the important fallacy is that *what you gave is not necessarily what acted*.

The reasons for fallacies of this type are extremely numerous, but often quite difficult to detect. For instance if we are using small laboratory animals (rats, mice) usually the whole group receiving the same kind of treatment is housed in the same cage therefore, they are likely to be affected by anything that is particular to this cage. An infection may be transmitted from one animal to all the others in

the same cage. One particularly aggressive individual may fight with the others and thus interfere with their well-being and food intake The water bottle which supplies the animals in this particular cage may be blocked The metallic grill, which acts as a floor in most of the common types of animal cages, may be corroded and produce a traumatic arthritis in the paws, etc.

This possibility of error is so evident that many readers will consider its discussion superfluous Yet, I would like to point out here, for the benefit of the younger investigators, that I have devoted virtually my full time during the last quarter of a century to laboratory work on experimental animals and yet, hardly a month goes by when I am not fooled by one or the other forms of this trap. Fortunately being particularly aware of it, I take the most elaborate precautions to ascertain that such sources of error be discovered before accepting the results as due to my treatment. However even the most careful statistical analysis of the data will not help here. The apparent differences are undoubtedly significant, but they are not due to the agent listed on the experimental protocol.

To avoid this type of error it is necessary always to watch experimental animals personally and not to confide their supervision to technicians Furthermore, whenever possible, each experiment should be repeated several times, even if only on small groups of animals. From a statistician s point of view a group of 30 rats treated in a given manner simultaneously is the same as six groups of five rats receiving the same treatment at different times. The true biological significance of the latter ex periment is, however infinitely greater than that of the former In rats kept in different cages and observed at different times, any one of the errors mentioned above is quite unlikely to occur six times in succession, by sheer coincidence, always with the same treatment

Of course there are many other reasons why we must constantly keep in mind the rule that what you gave is not necessarily what acted For instance, a compound injected may not be absorbed or it may be metabolized into an altogether different substance so that the effects observed are actually due to the latter (See for instance, the above mentioned experiments with MAD) The injection of a drug may cause much local irritation and inflammation under the skin and the organ changes produced may well be the result of this local damage, rather than of any specific pharmacologic property of the administered chemical.

The reader who considers it quite unlikely that these evident possibilities could be overlooked by an experienced investigator is encouraged to peruse the voluminous literature of the last few years on the assay of antiphlogistic drugs in rats. We have done this rather carefully in this Institute and repeated many of the published observations with various popular antiphlogistic drugs (sodium salicylate aspirin, butazolidin dibenamine, trypsin). Our results were quite unexpected

Most of the relevant work reported in the literature was performed using one of the three routine techniques developed at our Institute [the formalin arthritis the granuloma-pouch or the anaphylactoid inflammation (produced with egg white or dextran)] as indicators of inflammation and the supposed antiphlogistic drugs were injected subcutaneously Curiously all these drugs have an intense local

irritating effect upon connective tissue and produce widespread inflammation with consequent systemic stress. However this remained undetected because all the tests employed were of relatively short duration, hence, the necrotic tissue and the abscesses did not actually perforate In such acute tests these drugs tend to form a rather diffuse phlegmon, which can readily pass unnoticed unless the skin is separated from the underlying tissue and carefully examined. Nevertheless, the tissue damage is so widespread that the resulting systemic damage (shock) can inhibit inflammation even in adrenalectomized animals.

This does not mean, of course, that the drugs employed are not antiphlogistic, but merely that the experimental arrangements used could not have revealed their specific pharmacologic properties as these were masked by the much more intense systemic stress effect.

Trap No 7 Opposites Appear to be Most Dissimilar

Hardly any one will take exception to the statement that opposites are about as different from each other as any two things can be. No point on earth is further removed from the North Pole than its exact opposite, the South Pole If our intention is to cool an object to as low a temperature as possible, nothing could serve our purpose less well than if we heated it to the maximum of our capacity

Yet, here again, we are faced with one of those self-evident facts which are altogether false The North and the South Pole are farthest removed from each other in one sense they are actually quite like each other in many more respects (e.g climate, fauna) and they are the only two points which define the principal axis of the globe. Similarly whether we are to heat or cool an object, knowledge of the same principles of heat-regulation will be of assistance and, in general, the changes produced by heat will be the same as those evoked by cold, although they develop in opposite directions.

Almost any other example taken at random will illustrate the close similarity between opposites. If you start travelling westward on the surface of the earth, the faster you go the sooner you will be east of your initial position A perfect mirror image is the exact opposite of the original, yet it would be difficult to imagine anything resembling the former more closely Stereoisomers are nearly identical opposites.

There are many parallels to this in biology Anesthesia and excitation can be caused by the same drug Stimulation and paralysis of a muscle can result from mechanical trauma to the same nerve, etc.

At this point of our discussion, the proposition that opposites are quite alike seems to be the fact so self-evident as to be unworthy of so much consideration. However the history of medical research shows that the ambivalent mental attitude towards the problem of opposites is very likely to create psychologic mirages which can mislead the greatest masters in the art of clinical observation.

Take the case of Pierre Marie who, towards the end of the nineteenth century at a time when nothing was known about any relationship between the pituitary and growth, first observed cases of what he called acromegaly " These patients showed

manifestations of excessive growth and at the same time their pituitaries were replaced by tumor tissue. It is only natural that Marie thought the *pituitary may produce some growth-inhibitory substance* since destruction of the gland resulted in uninhibited growth In the light of his own later writings and of modern endocrinology this interpretation may strike us as being just about as wrong as possible. Actually being its mirror image, it is quite close to the truth. We must look out for this type of error but because of its close proximity to truth, the perfect opposite of the correct interpretation can nevertheless act as a most fruitful theory After all Marie's initial observation was still the first suggestion of a causal relationship between the pituitary and growth Probably many previous autopsies had revealed pituitary tumors in giants and acromegalics but it took the genius of Pierre Marie to suspect an interrelation between them.

Here again I could cite several instances where this problem turned up in connection with my own work. Among the corticoids DCA happened to be the first to become available by synthesis in amounts adequate for systematic experimental investigations Since an excess of it produced a variety of inflammatory changes in the connective tissue (periarteritis myocarditis, arthritis etc.), we concluded that *corticoids can predispose tissues for inflammation* and that, therefore the adrenal presumably plays an important role in the pathogenesis of various inflammatory diseases.

I had learned several years earlier that adrenalectomy does not diminish the inflammatory potential and, indeed, that the anti-inflammatory effect of stress (e.g., in anaphylactoid inflammation ") is blocked by the ablation of the adrenals This suggested of course, that during stress the adrenal exerts an anti-inflammatory effect but, curiously when it came to the interpretation of the DCA experiments, I failed to take these earlier observations into consideration. The resulting hypothesis concerning the action of corticoids in inflammation was not actually the opposite of the truth but only one half of it, while it could have been formulated much more completely had I remembered that often opposites are not far apart and that the authority of the class name "corticoid should not be overrated Only later when we took this into consideration did it become possible to complete the hypothesis and arrive at the conclusion that the adrenal can both increase and decrease the inflammatory potential and that some corticoids are prophlogistic while others are antiphlogistic.

The so-called *asbestos suit theory* of cortisone action was an altogether different kind of misconception, but it had its origin in the same psychologic mirage and it applied to almost exactly the same topic. It will be recalled that soon after cortisone became available for clinical use, the hypothesis was formulated that it acts in so many different inflammatory diseases because it puts some kind of an impenetrable barrier an asbestos suit, between the potential pathogen and the sensitive living tissues

Actually the antiphlogistic hormones act mainly by interfering with the development of the granulomatous barriers whose chief vital function is to effect such a separation. They do not prevent the pathogen from attacking tissues On the contrary cortisone facilitates the production of necrosis by irritants (e g croton oil) or the spreading of infections (e g tuberculosis) Its rather nonspecific beneficial

effect in so many inflammatory diseases is precisely due to the fact that, in most of these, the formation of inflammatory barriers between the pathogen and the tissue is excessive. Indeed here, inflammation is the disease or at least, the cardinal disease manifestation the patient experiences [30]

My principal reason for belaboring this point was to show that whenever we formulate a theory we should remember that opposites are not far apart. It is often well worthwhile to consider carefully the possibility of interpreting our data in a way which is exactly opposite from what our first inclination would dictate.

EPILOGUE

This paper has become much longer than I had originally planned it to be and yet I appear to have said almost nothing about the main topic of this Symposium, The Art of Medical Writing To my mind, the most essential part of medical writing is the evaluation of the pros and cons, first for making observations, then for describing them, and finally for drawing certain conclusions from them.

The choice of a truly important problem and the clear formulation of the lesson learned from its study are the real art in medicine and to bring these out clearly in a paper is the art of medical writing

There are, of course, many little technical tricks one should know How to subdivide material into chapters entitled Introduction, Materials and Methods, Results, and Summary· how to assess statistical significance and to choose between tabular and graphic summaries of data, or to learn that photographs should only be used when the true shape of things is really important. But all these are incidentals and besides they have frequently been explained by others.

I might also have tried to show how to present data in an austere, factual, and concise style, shorn of all the unessentials, but if you followed my advice you would be criticized for being unimaginative and for presenting a dull catalogue of facts.

I might have tried to show that it is possible to make even the most technical report vivid by always showing the broader implications of the work in polished and eloquent prose, but you would be accused of showmanship

Who knows, perhaps I might have gone so far as to admit that, in my opinion there is no harm, even in certain medical works, in expressing, if you feel like it, thoughts the understanding of which would presuppose a deep-rooted reverence for the miracles of Nature and a cultural background permitting an occasional reference to the concepts of scholars outside of our immediate field. But beware! If you did this, you would be called a philosopher and this adjective, when applied to a contemporary physician, has come to be the greatest of insults

So I thought it best not to discuss either the mere form and technique, or the supreme ultimate aspirations of medical writing but rather to concentrate upon the many fallacies which we must void if we want to obtain truly significant results.

In practice, if you accomplish this, all the rest does not much matter

Therefore, I selected for special consideration a series of dangerous traps" in scientific reasoning illustrating each with the sad but actual stories of uthors who were caught (usually myself). As we look back upon these manifold traps and

fallacies, we realize that, in the final analysis, all of them fall into one of the three groups which might be described as (1) the upsidedown mirage, (2) the mirror image and (3) the red herring

My advice is this

Learn to concentrate, despite all traps, pitfalls, and mirages first upon the selection *of a truly meaningful topic* and after your work is completed upon the *appraisal of its true meaning*

Remember that it is so easy to miss this point and not to see true meaning when it presents itself

upside down like this

in a mirror like this

or with this tiny red herring ^ | like this Trae medning

and then you can miss its True meaning

Of course, all these weaknesses in the evaluating machinery of our brain have long been known to psychologists but, like some other more pleasant weaknesses of the flesh they continue to raise havoc because of their almost irresistible temptation Knowledge is not enough to avoid them. Only if the horrible fate of those among us who have fallen into these traps can deter others will we be able to say We did not fall in vain.

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An Editor's Prejudices

Hugh Clegg M.A. M.D. F.R.C.P.
EDITOR, BRITISH MEDICAL JOURNAL
LONDON ENGLAND

I found it difficult to refuse Dr Martí Ibáñez's request to contribute to this Symposium on medical writing because he imposed on me no limitations on subject or length and threw out only the slightest of hints about the projected date for the receipt of my manuscript. I hesitated nevertheless because I doubted whether I could say anything that would profit the reader hesitated perhaps, because editing and writing are two quite separate functions hesitated, especially because of an uncomfortable feeling that medical literature already suffers from a surfeit of words

THE IMPARTIAL NEGATIVE

So far as I know there are only a few medical journals in the world whose proprietors employ a full-time editor among them the *Journal of the American Medical Association* and its counterpart in the United Kingdom, the *British Medical Journal* which I have the honour to edit. I use the word honour deliberately though in the context it has a very commonplace and pedestrian ring about it. To edit the *British Medical Journal* is regarded as an honour and I have often wondered why It is a harassing exacting worrying and ungrateful kind of job. Much of one's time is spent in saying No! to writers of monographs, articles, books, and letters and to advertisers—self-advertisers and the legitimate trade. Each year I have to reject solely on grounds of space some two thirds of the articles submitted for publication in the *British Medical Journal* These disappointed authors cannot feel otherwise than a bit cast down, and however polite the formula of rejection they will consider the editor an obstacle in the way of their progress. As a full-time editor who no longer practices medicine or works in the laboratory I often feel acutely uncomfortable when returning to an author a paper which is the result of weeks maybe months of patient observation by the bedside and experiment in the laboratory—work summed up in voluminous tables histograms and the like work one has sadly to reflect at times, which had much better be left undone or done in a different way At least, I feel that is some justification for the existence of full-time medical editors who do not practice their original profession By looking on and seeing all sides of the game they do stand a chance of achieving impartiality They can sum up the opinions of two or three expert referees on a paper and come to the final decision which every editor has to make Yes or "No It is in the exercise of this judicial capacity that a medical editor is taxed most severely He needs a fund of that rare commodity common sense an ability to assess evidence and nose for the humbug the self advertiser for the man who wants to sell so

I know it is a good exercise for the young man to try his hand at recording on paper observations he himself has made: Writing Francis Bacon said maketh an exact man. I know that when a doctor is applying for a post the selectors attach importance to his published work. I know that certain clinics expect each member of their staff to publish at least one paper a year There is consequently an enormous pressure on the editors of medical journals in Britain, and, I believe, in the United States to print an ever-growing number of articles, and for this pressure those in charge of teaching schools and clinics are, I would submit, much to blame. Then there is the race for priority often an unseemly race. A new drug is put on the market, and the would-be author feverishly tries it out on a limited number of cases, often without suitable controls, in order to record his impressions of it in the shortest possible time. I can very well sympathize with this desire to be first in the field. It is not always just a question of vanity or misplaced ambition A job may depend on it. A man who can have his name attached to a new observation has a good chance of obtaining the post he wants. And it is the physical fact of publication that counts Yet I feel that authors and their advisers, and editors too, might exercise greater discretion than they do in this almost feverish search for priority and prestige. If only workers would wait until they had thoroughly investigated a problem before seeking publication! If only editors would refuse to publish papers unsupported by adequate evidence! If only the reader might retort, human beings were not so stubbornly human and did not crave what Milton described as that last infirmity of noble mind —fame.

HOW MUCH EVIDENCE

How much evidence should be given? Many writers think they are providing evidence when they attach to the record of one case an impressive array of references to the literature on the subject, and thus try to make an article out of it. This busy search into periodicals and books may be evidence of an author s industry and a really critical appraisal of the literature on a subject is often of high value, and indeed may be an essential preliminary to new work. But I recall an author saying that he would submit a paper after it had been processed in the library of his institution. This processing included among other things, the librarian providing a complete bibliography of the subject. Since then I have often wondered how many authors actually have looked at, let alone read, the articles listed in their bibliographies. Much time, effort, and sorrow will be saved when authors review the literature on their chosen subject only when this is indispensable to their investigation and the discussion of the results obtained

And then there are the tables and charts the graphs and scatter diagrams, the formulae and equations and statistical jargon. How forbidding it all looks to that convenient abstraction—the average reader! But how can the reader assess the validity of a conclusion unless he knows what methods an author has used and is given the data which are the raw material of the calculations? Medicine is becoming, and will always be in a state of becoming, an exact science. The more exact it

becomes the more will measurement creep into its procedures and insist upon being expressed in numerical terms Though tables oppress the clinician, the editor I think, must see that numerical data are properly presented and given their fair share of space

STYLE

So much for the language of size a language which I admit I venerate with that helpless kind of awe one reserves for the unknown. Words are a more deceitful kind of coin and by frequent and wrong usage often lose much of their pristine freshness and beauty I recently spent several hours going over a long paper written by a friend of mine an authority on his subject, but one who found words an obstacle to the expression of his thought. My first revision was devoted to deleting words and phrases which seemed to be superfluous. In subsequent revisions I tried to redraft some sentences and paragraphs in order to make the meaning clearer and more concisely expressed In attempting this I found it difficult to be quite sure what some passages actually meant, and in rewriting these knew that I might be misinterpreting the author When I went over the revision with him he told me that the obscure passages of his paper were concerning those aspects of the subject with which he was least familiar At one point he remarked What I was really trying to say here was All right, I rejoined let s put it down in the clear words you have now used. I have frequently found this a most useful device for clarifying an ambiguous expression.

Style is the art of being clear without being mean Aristotle is alleged to have said Clarity lucidity simplicity brevity are all desirable and rare qualities in medical writing The doctor who sits down at his desk to compose an article must, I think, be assailed by horrible doubts and fears As a novice he tends to think that some rather unusual qualities are called for in this mode of expression He sees his paper as something that may one day appear in the literature on the subject. That awful word literature! He becomes most self-conscious of himself as a writer of Prose spelt with a capital P Too often he thinks that good prose consists of long words strung together in long sentences He writes It is my carefully considered opinion that, instead of I consider or I believe, All the available accumulated evidence goes to demonstrate that instead of The evidence suggests And the author can give the evidence in his references. Then there is medical jargon The patient had no pathology One might as well say The patient had plenty of physiology He was a strangulated hernia. She was a carcinoma breast Such things are said in the wards of hospitals, and are a con venience to the user Every profession and trade has its own forms of expression, but doctors seem reluctant to distinguish between the spoken and the written language At least this is partly the explanation In these days of television the cinema, the radio and the illustrated magazine, reading and writing are at a discount He who runs may read, it has been said And he who reads may write, and how he writes will depend much upon what he reads. The doctor today has to read so many journals to keep up to date that he has little time left to cultivate the garden of his mind which n consequence becomes cluttered up with verbal weeds

Words, as many people have said are often used to conceal thought or the absence of it, and in such an inexact science as medicine this misuse of language is a temptation. Some 35 years ago in the *Times Literary Supplement* the writer of an article on The Decay of Syntax picked on the following two medical examples

> A man who is uncertain of his facts will write without a twinge of conscience such a sentence as this The percentage of mortality due to measles is often exaggerated. If he had said that *fewer people die of measles than is supposed* he might have asked himself if he were sure it was true.

> The man who writes instances of premature mortality are more frequent in the case of men than in the case of women, when he means that *more men die young than women* sins against light. Such writing is vicious not because it is pompous, but because it is dishonest.

The writer found among the vices of modern prose indifference to etymology and the proper meaning of words, a tendency to prefer the abstract to the concrete, to use nouns instead of verbs, and a careless acceptance of worn-out phrases. In medical writing one finds also an overfondness for adjectives A problem must always be an *important* problem. Three important problems are now being attacked " thus begins a sentence in a recent editorial. To attack is to fall upon, to assault, and to do this to a doubtful or difficult question, to use dictionary definitions seems to me to be unnecessarily violent and cannot be justified by adding the word important The writer evidently had a faint recollection of the idiomatic usage to tackle a problem. *Immaculate* laboratory procedures and *meticulous* care are two other specimens I have collected. Meticulous is defined as over scrupulous about minute details, coming from the Latin *metus* which means fear In the above phrase, commonly used by medical writers, it is supposed to mean great care or scrupulous care, but it does not. The word immaculate, out of its traditional religious context, is usually employed ironically To say man is immaculately dressed is to imply that he is manifesting sartorially an innate narcissism. Immaculate, used scientifically means without colored spots or marks I have too seen the word meretricious pop up its ugly head when Dr X refers to the meretricious arguments Dr Y uses to support his thesis. Dr X probably means specious or plausible, and would probably be shocked to learn that meretricious (from the Latin *meretrix* = a prostitute) means of pertaining to characteristic of, or being, a prostitute I would not suggest that one should always go back to the original meaning of a word, and deny the use of its subsequent connotations. But it is often enough mental laziness that lets these extensions of meaning slip into a language. It is important to know the meanings of the words one employs, and a knowledge of their etymology is a powerful aid to understanding Nearly all people when they speak, and many if not most people when they write, rely upon vague impressions of what words mean. When a doctor writes the words ions and electrons, inflammation and tumour skin and bone he attaches precise meanings to them, meanings so precise that they will be precisely understood by medical readers.

But when he uses the ordinary language of the market place he seems to throw pre cision to the winds, sometimes with such abandon that it is difficult to understand what he really does mean. The first thing I present to a newcomer to the staff of the *British Medical Journal* is the *Concise Oxford Dictionary* If people knew the meanings of the words they speak and write life would be simpler and more harmonious

Few if any are likely to write a scientific article as if it were to be a contribution to belles lettres. But most doctors find composition difficult They groan and sweat and swear as the words fail to come together in orderly sequence upon a white ex panse of paper When they think of style they fearfully recall a schoolmaster s warning not to split an infinitive and never to end a sentence with a preposition Yet the best writers of English have never hesitated to end a sentence with a preposi tion, especially if it makes the ending emphatic, and a bold man will not hesitate to split an infinitive if this is the most effective way of making his point. There is always some linguistic snobbery in vogue. A few years ago that good old-fashioned word commence had a black mark against it in elegant journalistic circles The Anglo-Saxon word begin was preferred to the total exclusion of commence As it was in the beginning, now and ever shall be In the beginning was the word. In spite of these hallowed phrases commence and commencement fall at times naturally into place in a formal sentence written by someone who is not ashamed of the great drafts made by the English language on medieval French and Latin.

However limited a man s vocabulary may be, he can, I believe learn a few simple rules of the craft of writing and by practice become proficient at making the written word plain to understand and even lively Here are two tips I think are useful The first is this use the active and not the passive voice One of my colleagues recently showed me what he thought was a very dull report of a meeting He was puzzled by this because the facts in the report were quite interesting The first thing that struck me in reading it was the predominance of the passive voice, with its deaden ing effect on the mind Substitution of the active voice for the passive made all the difference I hit him as he was crossing the road is more direct and arresting than He was hit by me as the road was being crossed by him. The second tip is when you can, use the concrete and not the abstract The first case was a male is much less effective, and less human than The first patient was a man. Finally unless you have the literary skill of a Proust do not get lost in the convolutions of a long sentence

Whatever verbal skill a writer may have it will in the end avail him little if he has nothing much worth saying He will often enough betray this by padding out his sentences with adjectives and adverbs by writing a rather high-flown tortuous kind of English, by passive construction (indicating lack of action by him) by in version, by the use of abstract nouns by the paucity of verbs Simplicity lucidity clarity brevity—all will be marked by their absence. And much of this is I believe to be attributed to the hot-house production of medical articles artificially stimu lated by teachers in medical schools and clinics So I return to the beginning of this somewhat di jointed essay reflecting somewhat sadly on the hundreds of thousands of words that pour yearly into the offices of the *British Medical Journal* words wrung

with great difficulty from the cortical cells of earnest and hard-working students of human nature, words tapped out onto paper by stenographers words (some of them) to be set into type by operators, words to be printed in black ink on white paper made up into periodicals and books dispersed throughout the world, words meant to instruct but which often confuse—and my conscience condemns me for doing that which I find a fault in others, writing an article without really having very much to say

Medical Writing

Walter C. Alvarez, M.D

FORMER PROFESSOR OF MEDICINE, UNIVERSITY OF MINNESOTA

EDITOR, MODERN MEDICINE

CHICAGO, ILL.

I can take the text for my short sermon from an article in *Medical Economics* by Dr Henry A Davidson, editor of the Journal of the Medical Society of New Jersey He says that his wastebasket is stuffed with the writings of doctors who didn t stick to the point and didn t make things simple. Obviously every medical writer who expects to have his material read should note this and then stop and ponder If writers won t say what they have in mind quickly and in interesting clear and simple speech, Dr Davidson and thousands of others like him just won t stop to read the stuff

Today there are so many articles clamoring for attention that a doctor reads only those few that attract him as he looks at the title the first paragraph or the summary The big trick is to capture the reader s attention in the first paragraph and then to hang onto it

I always marvel at the poor sense of the writer who either starts his article with uninteresting material, or after he gets going interrupts his discourse and gets rid of his readers by inserting a lot of dry and uninteresting material on technique. He should put this material in an appendix at the end where it can be read by the rare man in a thousand who may want to repeat the experiments or to see exactly how they were performed

A score of times as an editor I have written to a contributor saying I will accept your manuscript if you will throw away the preamble and begin on page 4 I want you to jump right into your subject

I used to say to a student who was writing an article on, let us say the electrocardiogram of the digitalized heart Imagine the editor s mental processes when he picks up your paper He is likely to groan a bit and say How can anyone write anything new or interesting on this subject?' As an editor of *Gastroenterology* I used to groan whenever I got a paper on gastric acidity Because of this attitude of editors and readers, I would say to my students, Start your paper with a clear-cut, brief statement to the effect that still after all the work done on the digitalized heart (or gastric juice), there is a big gap in our knowledge. State what that gap is and then say that the work done by you was designed to close the gap. State also, that you think your work has thrown much light on the problem."

Occasionally a writer will have to take a few paragraphs to show that the widely accepted explanation of a certain phenomenon is inadequate or certainly wrong Then he can go ahead and give a new explanation Today the tendency of some wise editors is to ask authors to leave out historical details and long bibliographies, especially when an excellent bibliography is easily available in some journal

Although there are still some editors today who insist that the papers submitted to them be written in technical jargon I believe all writers who want their work to

be read should write, so far as possible, in simple Anglo-Saxon English wherever the work permits I know editorial assistants today who always cross out urination to put in micturation, who cross out vomiting to put in "emesis, and who cross out measles to put in morbilli but I hope some day they will all be dead and gone and sitting on a hot seat in Hell!

As my old general practitioner father used to often say to me, After I get in off the road about 10 30 at night, terribly tired but wanting to do a little reading before I fall asleep, the English must be simple. On a Sunday morning I can read medical German, but Saturday night I can t read even highly technical English." Obviously if a medical writer wants to catch and hold the interest of very busy men he must make his papers short and pithy he must use simple vivid English, he must have something to say that is of value, and he must say it in the smallest possible space

Because, as we physicians grow older and wiser we come to depend more and more on summaries of articles, the good writer will take great care in preparing a good summary of his material I think the time must come when editors will put this summary at the beginning of the article where it belongs, and not at the end I almost always read a summary first, and if it interests me go to the beginning and read the article.

We medical editors always wish writers would shorten their case reports, leaving out all unimportant details. For instance, in describing an autopsy one doesn t have to copy it as it came from the pathologist. All one need say is perhaps that there was only one significant finding and that was rupture of a vein in the esophagus, due to a cirrhosis of the liver

All editors, I think, wish that medical writers would just report what they have seen and observed and done, and leave out the theorizing as to what it means I often think how wonderful a textbook Hippocrates could have written if he had only described accurately the symptoms of a few cases of such diseases as peptic ulcer migraine, rheumatoid arthritis or gonorrhea Unfortunately he and Galen spent practically all their time theorizing about the several humors of the body

There are a few papers being written today which will be classics 500 years from now I am sure these papers contain practically nothing besides facts of observation.

One of the best tricks I have learned in the last 50 years of writing is this when I finish a paper I put it away for perhaps several months Then when I get it out again I can see all its defects, and I can edit it as viciously as if it had been written by an enemy of mine After several such editings I may decide it is ready to be sent to an editor

When I think I have finished a paper I go over it and tear out every adjective, adverb or sentence which I think can go. It is interesting to see how unnecessary most verys are in a paper

One reason why a young man should study hard to write as interestingly as possible and always about something that is worth commenting on is that eventually some day thousands of physicians throughout the country on seeing his name at the head of an article, will stop to read it. They will say to themselves "This fellow always has something to say and he says it well Let s see what he is interested in now

Books in the Physician's Life

Félix Martí-Ibáñez, M.D

EDITOR, INTERNATIONAL RECORD OF MEDICINE AND GENERAL PRACTICE CLINICS

NEW YORK, N Y

This essay is dedicated to W Somerset Maugham, my admired friend, the greatest living example of the physician as homme de lettres.

Books and Medicine. The Physician Library Throughout History The Three Intellectual Circles of the Physician. The Magic Door Recreational Readings. The Physician as Man of Letters. Novelists as Life-Friends to the Physician. Professional and Scientific Reading In Praise of Basic Textbooks. Medical Journals and Their Mission. The Value of Medical Abstracts. The Present and Future of Medical Advertising. Reading for Improvement. How to Find Time to Read. War on the 'Chronophages. Humanistic Reading In Praise of Reading in the History of Medicine. How to Select Reading Material. L'Envoi.

Give us the power to speak beautiful words; keep the rest.
Walt Whitman

BOOKS AND MEDICINE

Books and patients are the two poles of the axis about which revolves the professional life of a physician. Without patients medicine would not be an art without books it could not be a science Medicine is based on experience and the only way of recording and perpetuating that experience is the written word

In the beginning was the Word, says the Gospel Without words there would be no transmission of thought without thought there would be no humanity—no science All the professional experience of the best physicians in the world would mean little unless verified by what books say about those very same clinical phenomena The book is the silent record of medical thought, just as the patient is the living record of human pain

So long as medicine was only a *ars medendi* the desire to cure the sick it was transmitted orally from teacher to pupil It was an art of the public square, the gymnasium, the forum, passing from the pale dry lips of the master to the eager ears of the pupil But as soon as medicine had at its disposal a graphic record—Assyrian cuneiform tablets Egyptian papyri Aztec stones or medieval parchments—the era of medicine as a science began

The book was to medical science what the spoken word was to the art of healing Whereas the teacher of medicine taught a group of contemporaneous students, the medical author from Hippocrates onward taught posterity Hippocrates himself did not need books because he was his own library but when he compiled his *Corpus* he bequeathed reading matter to countless generations of physicians

Books have always been the best index of the cultural progress of the physician in history The only book the primitive witch doctor had was the patient himself but the physician library has always been a window open to the lights and shadows of his intellect.

From Hippocrates' days on, the physician has accumulated in his library books dealing with medicine, the humanities and the fine arts. At first, those books were an integral part of the threads depicting the immense polychrome tapestry of human knowledge. But from the middle of the seventeenth century to the beginning of our own century the physician was interested almost exclusively in medical books and there was great need for the counsel of wise men—such as the Spanish physician-philosopher Letamendi who said that "the physician who knows only medicine does not know even medicine"—to *ritornar al segno*: return to the concept that to know a little about medicine the physician must know a lot about other things.

There was a time—so remote that it seems mythological—when the physician could boast that he had read everything or almost everything of any importance written on medicine. In Galen's time medical literature had scarcely begun, and the Hippocratic *Corpus* was practically the only basis of scientific medical knowledge. By medieval times, however, the physician, who was often a monk, already had at his disposal a great number of medical manuscripts pouring in from Greece and Rome, which multiplied to a fantastic number during the Renaissance, when the famous schools of medical translators were established in cities like Toledo.

When the printing press was invented, facilitating the transmission of medical knowledge, it became difficult for the physician to assimilate everything printed concerning medicine. Yet the task of acquiring a medical culture was still comparatively simple, because for centuries medical knowledge tended to crystallize into heavy texts undisturbed by the present-day avalanche of medical journals.

Only at the beginning of the nineteenth century, when the ocean of medical knowledge, already overflowing the dikes of cardboard and cloth built by book covers, fanned out into journals and other types of publication, did the professional life of the physician become truly difficult.

The idea then emerged, and still prevails, that medical books are the crystallization of classic knowledge only, and therefore are condemned eventually to pass out of fashion, and that anything of any value can only come out of medical journals. Thus the physician has become a galley slave in perpetual servitude to thousands of medical journals published today throughout the world which relay anything old that medical writers can recollect or anything new they can think of.

Half a century ago the physician learned medicine from textbooks. Today he learns medicine from the medical journals, using books only as reference works whose formidable appearance and weight make of them elephants to be put away and taken out for a slow tedious walk only once in a while. The general trend now is to run even if it leaves us without breath, with the impatient herds of current medical journals.

There was a time when the physician enriched his knowledge by the simple expedient of observing his patients and occasionally heeding the advice of an old colleague or listening to a lecture by one of the wise old mentors of Medicine. One acquired medical wisdom through the windows of the senses; the ear was especially important for it absorbed the words of the teacher while the other senses served for the attainment of as perfect a knowledge as possible of the person of the patient.

The introduction of the medical textbook radically changed the teaching of medicine From a discipline acquired by listening it became a lesson to be read Medical knowledge was no longer transmitted orally from master to pupil usually at the patient s bedside It became instead a rather lonely learning process carried out sometimes at the patient s bedside, but more often in the office library or work room alone with a book containing the sediment of medical knowledge deposited by several generations.

Today medicine is taught with emphasis on the visual elements through books, journals and other forms of printed matter supplemented by medical films and that other great vehicle which may hold the key to medical teaching in the future television.

If we limit ourselves to printed matter we may say that nowadays the physician learns medicine from books (textbooks medical books monographs or encyclopedias), medical journals, and, I would add the copious flow of medical literature issued by pharmaceutic companies, which for the most part is today so successfully accurately and tastefully done that it has bestowed a new dignity on that much discussed and often misunderstood and undervalued art, medical advertising

Bombarded from all sides with popular and scientific medical literature the physician cannot help being completely submerged in it Medical literature is perhaps the most dynamic of all literatures because it embraces both the science and the art of saving human lives Medicine is action and as Stendhal said *La joie de l'âme est dans l'action* (The soul finds its delight in action)

THE THREE INTELLECTUAL CIRCLES OF THE PHYSICIAN

What does what should, the physician read?

Let us remember that even more important than being a physician is being a man, and that the physician s professional value is closely linked with his status as a human being One cannot become a great physician without being to a degree great in one s personal daily life Spiritual *savoir faire* and dignity in private life very often underlie competence and skill in the art of healing A great physician usually also bears the mark of a great man

Reading and study act as catalytic agents on human greatness One does not become a great man simply by reading great books but such books may act as shafts of light to illuminate the treasures of greatness that lie dormant in the deep dark mines of the human spirit It is therefore even more important to the physician to determine what he *likes* to read as a man than what he *must* read as a physician lastly he should consider what he aspires to read as a member of society

We are therefore confronted with three concentric circles of intellectual activity each embracing its own horizon of reading the physician as a man the physician as a professional the physician as a member of society and maker of history

The first of these categories crystallizes the physician s most intimate desires and human needs the second takes care of his need for information as a professional the third satisfies his confessed or unconfessed social mission in space—in his country —and in time—in his own period and in history Let us examine then what

these three types of reading matter are and what they should be recreational for the physician as a man informative and educational for the physician as a professional and progressive for the physician as a member of a society and of a culture.

THE MAGIC DOOR

What is reading?

Quevedo (1580-1645), the Spanish poet and satirist, defined it in an immortal quatrain

> "Retirado en la paz de estos desiertos
> con pocos, pero doctos, libros juntos,
> vivo en conversación con los difuntos,
> *y escucho con los ojos a los muertos.*"[1]
>
> (Withdrawn into the peace of this desert
> With few but the wisest books,
> I live in converse with the dead
> *And with my eyes I listen to their speech.*)

For Descartes, reading was *une conversation avec les plus honnêtes gens des siècles passés* (a conversation with the wisest men of bygone days).[a]

We may then broadly classify the physician's reading as reading for *pleasure* reading for *work*, and reading *out of duty* With the first he learns to develop as a man and fly on the wings of the spirit, with the second he learns to master his profession, navigating with the sails of his knowledge and with the third he learns how to become worthy of his country and of his period, thus leaving behind him a cultural mark on the face of humanity

RECREATIONAL READING

Reading for pleasure is not the same as reading for escape Art is escape [illegible]

Arthur Conan Doyle, physician and writer spoke thus of the magic door of his library [illegible] what mood man may be in, when once he has passed through the magic door he can summon [illegible] greatest to sympathize with him in it. If he be thoughtful, here are the kings of thought [illegible] here are the masters of fancy Or is it amusement he lacks? He can signal to any one of the [illegible] story-tellers, and out comes the dead man and holds him enthralled by the hour [illegible] company that one may come to think too little of the living.

"But best of all when the dead man['s] wisdom and the dead man['s] example give us guidance [illegible] in the living of our own strenuous days.

"Come through the magic door with me, and sit here on the green settee [illegible] oak case with its untidy lines of volumes. Smoking is not forbidden. Would you [illegible] of them Well, I ask nothing better for there is no volume there which is not a [illegible] and what can man talk of more pleasantly than that? The other books are [illegible] own favourites—the ones I care to re-read and to have near my elbow [illegible] does not bring its mellow memories to me.

"I care not how humble your bookshelf may be, nor how lonely the room [illegible] door of that room behind you, shut off with it all the cares of the outer world [illegible] ing company of the great dead, and then you are through the magic portal [illegible] worry and vexation can follow you no more. You have left all that is vulgar [illegible] you. There stand your noble, silent comrades, waiting in their ranks [illegible] Choose your man. And then you have but to hold up your hand to him and [illegible] dreamland."[2]

from reality for the artist but in the enjoyment of art—and art includes reading—reading should not become that *vice impuni* mentioned by Valéry Larbaud. The pleasure of those who read voraciously and indiscriminately preferring a sloppy concoction of beans to a delicate dish of intellectual caviar is nothing but an unpunished vice So great is the pleasure of this type of readers that they read anything anywhere at any time, in a deliberate attempt to escape from the world of reality into a world of fantasy Such reading is an opiate or a refuge that masks the reader s world and hides from him his own soul

True recreational reading satisfies the spiritual needs of the physician as man

What is the main value of such reading? I would say the same as it was at the beginning of history entertainment. Early man loved to sit around the fire, under the blinking stars and listen to tales of adventure and mystery When those stories were perpetuated in written form, man continued to read them that is he kept on listening to them with the inner ear of the intellect.

Today man is more than ever interested in tales that divert him for a while from his pressing daily tasks and bear him over land and sea on the Pegasus of his mind to remote places where adventure fills the air He still loves to listen, in the eerie hour between dog and wolf when the last day departed and we settled ourselves in the smoking room for a sleepy evening of talk and tobacco "[3] to stories of bold men who like John Buchan s heroes dared to seek out unpathed waters, undreamed shores

The physician does not exist who after a few hours of such diverting reading does not return to his task with a spirit lightened by the conflicts of the heroes he has just met, by their fate-tossed lives, for as the *Aeneid* says *Quisque suos patimur manes* each one must suffer his own destiny

The physician should enjoy even more than others this type of purely recreational reading whether it be detective novels books of travel and adventure or more recently scientific fantasies for it pours balsam on his soul battered by the constant spectacle of human suffering By means of the spiritual ennoblement of reading, the physician may escape becoming an automaton incapable of displaying emotion or a cynic wearing the mask of professional skepticism.

Why should the physician read literary works? Primarily as we said before, for entertainment, since this is after all the greatest mission of literature Literature, said G K Chesterton, is a luxury fiction is a necessity The simple need for some kind of ideal world in which fictitious persons play an unhampered part is infinitely deeper and older than the rules of good art, and much more important.

An hour or two of recreational reading and the physician may return to his daily task – that exacting often harrowing emotion-laden task—refreshed in spirit by the vision of horsemen galloping at breakneck speed over frost-covered highways under a faint silvery moon of mysterious travelers in dusty capes rapping their whips on the closed shutters of a deserted inn of snowy paths in a silent forest, crimson under the setting sun of taverns with frozen black windows framing an interior of candlelit tables jugs of wine and men embarked on a night of drinking gambling and singing by a blazing fire

The love of story and fable belongs to all times and all places Physicians once

gathered around storytellers in ancient Mesopotamia, today they go to their St. James Street or Park Avenue clubs to read stories. The mission of recreational literature is not to educate but to entertain. In quest of such diversion, the physician has recourse to reading during those hours that the Romans called *otium*, the hours of rest from the pressures of life in contrast with *negotium* the negation of rest and leisure which is business or duty

There are physicians who entertain a sense of guilt over their fondness for recreational reading and try to justify it by calling it a pastime or a *hobby* a derogatory word often used by people who do not understand that a pastime frequently represents the truest, most authentic aspect of living, especially when that pastime is reading instead of bridge or television.

This matter is especially important because nothing reveals the true substance of a person s soul better than his favorite pastime. The active repertory of any given person is amazing in its limitations and boring in its uniformity We may be physicians or carpenters, painters or farmers, clerks or cab drivers, lawyers or dancers yet our daily tasks are extraordinarily alike, as alike as eating, loving, sleeping, and dreaming What distinguishes one person from another is not their occupation but the activities they choose in their leisure time. From that angle, there are no two people alike. There are no two physicians who spend their free time in exactly the same way even though we may all have the common denominator of our love for reading

Sometimes recreational reading may be valuable in supplementing our professional education. Let us recall Thomas Sydenham s immortal answer when the physician and poet Blackmore asked him what he should read to learn medicine. [illegible] *Don Quixote* it is a very instructive work. Although that puzzling remark has been interpreted as expressing Sydenham s contempt for the "official" medical texts books of his time the fact remains that when we read *Don Quixote* we learn about the medicine not only of Philip III's time but of all time. That book teaches us an impressive lesson in traumatology—comparable only to the *Iliad* —another in physiognomy and several lessons in Galenic pharmacy besides providing us with a wonderful psychiatric and endocrinologic typology Above all, we learn about the human being in sickness and in health from a psychologic viewpoint that is universal because it is so human.

Many literary works could teach the physician to recognize the medical processes affecting their characters, for instance, Don Quixote s madness, Camille s tuberculosis, Alyosha Karamazov s epilepsy the endocrine obesity of the fat boy in Th[illegible]

Robert Louis Stevenson pointed out most eloquently the importance of the novel: "The most influential books, and the truest in their influence, are works of fiction. They do not pin the reader to [illegible] dogma, which he must afterwards discover to be inexact; they do not teach him [illegible] lesson, which he must afterwards unlearn. They repeat, they rearrange, they clarify the lessons of life; they disengage us from ourselves, they constrain us to the acquaintance of others and they show us the web of experience, not as we can see it for ourselves, but with [illegible] singular change—that monstrous, consuming ego of our being, for the nonce, struck out. T[illegible] be so, they must be reasonably true to the human comedy; and any work that is so serves the turn of instruction. But the course of our education is answered best by those poems and romances where we breathe [illegible] magnanimous atmosphere of thought and meet generous and pious characters."

Pickwick Papers and he could then apply his knowledge to real life They can also teach us to describe disease with that literary flair—so lacking today—that can change a cold dry clinical history or scientific paper in to a beautiful warm piece of writing

History like science is continually created by scholars and artists as Sigerist has so brilliantly demonstrated [7, 8] Disease is a supreme esthetic experience and the artist the most sensitive of men, cannot help being affected by it. The literary works of a given age afford us a much more vivid medical picture of the times than any technical work Casanova's *Memoirs* [9] besides being a monument of artistic storytelling depict a dazzling panorama of medicine—sometimes as vertiginous as a saraband sometimes as graceful as a ballet, but always as merry as a tarantella—involving quacks doctors, and patients in the Venice and Europe of the 1700's as well as in the Russia of Catherine the Great.

Literature has indeed made a generous contribution to Medicine—in Erasmus' *Praise of Folly* in James Joyce's *Ulysses* in Thomas Mann's *Magic Mountain* in the novels of Stendhal and Dostoyevsky

Writers have always enjoyed creating literary figures inspired by living physicians [10] In his *Symposium* Plato gives us Eryximachus the physician who advises Aristophanes to sneeze in order to cure his hiccoughs In the *Canterbury Tales* Chaucer describes the medieval physician who claimed to have cured his patient through natural magic and was modeled after John of Gaddesden, the author of the *Rosa Anglica* Rabelais a physician of Lyons and a graduate of Montpellier generously sprinkled his immortal works with physicians. Shakespeare, with his knowledge of medicine and with characters like Dr Caius in *The Merry Wives of Windsor* modelled after the great John Caius [11] illuminated for us that sterile period in medical history stretching from Vesalius death to Harvey's discovery of the circulation of the blood Browning glorified Thomas Linacre one of the greatest humanist physicians in history in his *A Grammarian's Funeral* And in his *Anatomy of Melancholy* a consecration of the melancholy that was the author's constant companion, Robert Burton parades before our eyes an impressive cavalcade of physicians and their patients.

In Louis XIV's time Molière satirized physicians in his *Le Malade Imaginaire* and Le Sage, in his *Gil Blas de Santillana* created in the figure of Dr Sangrado a frightening example of the blood letter of that vampire age in medicine a man as drunk on vein openings as Guy Patin who bled his family his friends and himself into anemia from which they were saved only by the enormous amounts of water they drank to wash out the disease

In the eighteenth century Daniel Defoe wrote his *Journal of the Plague Year* a fictional but faithful account of the same events witnessed and related by Samuel Pepys Sterne created the querulous Dr Slop in his *Tristram Shandy* and Tobias Smollett satirized Dr Mark Akenside in *The Adventures of Peregrine Pickle* Jenner penned a tribute to the birds he adored in his *Address to a Robin* and Keats physician and poet, dreamed during his anatomy classes of those diamantine phrases that later

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"Browning on the *Anatomy of Melancholy* 15. S Carter said, is like spending a sunlit afternoon in dusty old library for Burton book is bookman book, an endless mosaic of many coloured patches."[12]

made him the greatest jeweler in words of the English language. In his vast work Charles Dickens satirized fifteen doctors and seven surgeons, some of whom, like Dr. Bob Sawyer of the incomparable carousals, are unforgettable. Thackeray and Trollope followed in Dickens footsteps. Robert Louis Stevenson created, among other physicians, the schizophrenic Dr Jekyll, and Dr Livesey the brave surgeon of *Treasure Island*

THE PHYSICIAN AS MAN OF LETTERS

The medical profession has produced more writers than any other more than law engineering and the other liberal professions The only exception is the clergy which, because of their perennial meditations on man and God has in the past produced as many great writers as medicine.

Since we cannot mention the entire roster we shall limit ourselves to pointing out that in England the literary tradition of Keats Thomas Dover (buccaneer and writer who in real life discovered Alexander Selkirk, the original model for Robinson Crusoe, on the island of Juan Fernandez), Oliver Goldsmith, Tobias Smollett, and others who were not physicians but nevertheless wrote medical books—like Robert Burton (a contemporary of Rembrandt, Velázquez, and Shakespeare!), who wrote the greatest medical treatise ever written by a layman"—is continued by physicians like Arthur Conan Doyle, Ronald Ross, A. J Cronin, and, above all, the prince of contemporary English novelists my admired friend W Somerset Maugham.

With his habitual elegance, Maugham has explained why a physician may very well become a great writer I do not know a better training for a writer than to spend some years in the medical profession I suppose that you can learn a good deal about human nature in a solicitor s office, but there on the whole you have to deal with men in full control of themselves. They lie perhaps as much as they lie to the doctor but they lie more consistently and it may be that for the solicitor it is not so necessary to know the truth. The interests he deals with, besides, are usually material He sees human nature from a specialized standpoint. But the doctor especially the hospital doctor sees it bare. Reticences can generally be undermined very often there are none. Fear for the most part will shatter every defence even vanity is unnerved by it. Most people have a furious itch to talk about themselves and are restrained only by the disinclination of others to listen. Reserve is an artificial quality that is developed in most of us but as the result of innumerable rebuffs The doctor is discreet. It is his business to listen and no details are too intimate for his ears. [3]

The best contemporary Spanish novelist is a physician, Pio Baroja, and years ago Spanish writers like Pedro Mata, Vital Aza, and Armando Palacio Valdés were also physicians. [4] In France the tradition of physician-novelist started by Rabelais has been continued by men like Georges Duhamel. In Germany and in Switzerland the glory of Schiller surgeon and playwright, was reborn in contemporary medical figures such as Albert Schweitzer In Austria we can point to the novelist and poet Arthur Schnitzler In Russia, alongside Dostoyevsky a physician s son brought up in the medical tradition, we have Anton Chekhov physician, storyteller and playwright. In the United States there are S. Weir Mitchell, a

Oliver Wendell Holmes, William Carlos Williams and Frank Slaughter [16] From Sweden came one of the greatest writer-physicians of our age Axel Munthe whose immortal book *The Story of San Michele* [7] has drawn pilgrims from the world over to his villa in Capri, there to lean—as I have done—on the stone railing custodied by pink marble sphinxes, overhanging his beloved *mare nostrum* of Homeric legends and gaze at the scintillating silver blue waters

NOVELISTS AS LIFE-FRIENDS TO THE PHYSICIAN

There is no pleasure so rewarding as having for life long friends a few selected writers whose inspired ideas crystal-like prose, idealism and lyrical essence embroider with enchanting colors the gray monotony of our daily lives * As Hazlitt said There are only three pleasures in life pure and lasting and all derived from inanimate things—books pictures, and the face of nature.

In literature, the physician looks for a screen on which to project the images of his own fancy For as Sir Thomas Browne said in his *Religio Medici* We carry within us all the wonders we seek without us There is all Africa and her prodigies in us. [18]

PROFESSIONAL AND SCIENTIFIC READING

It is the physician s duty to read and study textbooks and reference works, medical journals and other publications that will refresh his basic knowledge and keep him abreast of the latest happenings in medicine Ever since man developed the written word medical information has been transmitted down the generations in incalculable amounts certainly no one would even dream of reading all this exhaustive material

We shall mention only a few of the most famous medical books—the list compiled by Ralph Major [19] plus a few more—and even this short list will resound like clarions like a roll call of warships ready to enter an epoch-making battle in History

The Egyptian *Ebers Papyrus* (c. 1500 B C.), which described conditions like angina pectoris and contraceptives the *Corpus Hipocraticum* (460–375 B C.) basis of modern naturalist medicine the works of Galen (c. 130–200) landmark of experimental medicine The *Canon* of Avicenna (c. 1028), the Bible of Medicine for more than a thousand years *De Humani Corporis Fabrica* of Vesalius (1543), prelude to modern science *De Motu Cordis* (1628) by William Harvey herald of modern physiology *De Sedibus* by Morgagni (1761), basic pillar of pathologic anatomy *An Inquiry into the Causes and Effects of the Variolae Vaccinae* (1798) by Edward Jenner foundation of immunology *De l'auscultation mediate* by Laënnec (1819), which introduced one of the most valuable diagnostic methods in clinical practice *Die Cellularpathologie* by Virchow (1858) which revolutionized pathology just as the *Principles and Practice of Medicine*

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* I myself have four constant companions among British authors alone Stevenson, Chesterton, Conan Doyle, and John Buchan. I do not refer of course to the Stevenson of *Treasure Island*, but to the Stevenson of *The Master of Ballantrae*, *The Weir of Hermiston* and other less known masterpieces nor do I mean the Chesterton of the Father Brown series, for I prefer his poems, biographies, and literary criticisms; I do not admire the Conan Doyle of Sherlock Holmes as much as I do the author of the historical novels *Micah Clarke* and *The Refugees* and I love the John Buchan of *The Man from the Norlands* and *The Most Endured* more than I do the author of *The 39 Steps*.

of William Osler (1892) revolutionized the teaching of medicine, and Cajal's *Histologia* the teaching of modern histology.

These are but a few of the immortal medical books which like the runners of the classical Marathon, have for the generations passed from hand to hand the blazing torch of medical science.

IN PRAISE OF BASIC TEXTBOOKS

Of course, the physician needs to read and study basic texts of medicine, the so-called *reference books* which furnish essential information on any specific medical question.

What qualities should we look for in the books we consult?

First of all, *accuracy*. A reference book should include no opinions of the author except those that help clarify or define the subject under study: anything hypothetical or experimental should first be published in the form of articles in some journal and only in a textbook when research or clinical application and confirmation by other scientists have proved it to be valid.

Clarity of exposition generally goes hand in hand with beauty. I have never believed that a book must be obscure in order to be scientific. The best teachers of medicine all over the world were good writers in the sense that they were clear. Frequently they were also given to beauty of literary style, but even then the art of writing well was simply the crystallization of clear thinking. The works of Oliver Wendell Holmes, Osler, Cajal, Claude Bernard, Harvey Cushing, and Sherrington are as limpid as they are beautiful. Their concepts stand out on every page like polished pebbles in the crystal-clear waters of their prose. The "light" that Goethe frantically begged for on his deathbed has always been the guide of good medical writers.

Many of the obstacles that stand in the way of the progress of modern psychiatry derive from its grotesque terminology, a vast multiform jargon unnecessarily confusing, and from the compulsion felt by many colleagues to express themselves obscurely and technically so that, since only a few will understand them, they will be subject to a minimum amount of criticism. "Not only don't I understand the mysterious dialect of psychiatrists," said Marañón, "but when I hear them speak, I comprehend but half of what they say." This is the more deplorable since the "verbal" style of Freud himself—and before him Charcot's dialectic and Kraepelin's didactic styles—set one of the finest examples of clarity and harmony. Their prose was beautiful because of its pellucid *simplicity*.

Accuracy, clarity, simplicity: these should be the attributes of a good medical reference book if it is to become a constant and pleasant source of information for the physician.

The reference library of a practicing physician should contain, above all, the basic texts he used in his student days,† for their contents are a part of his professional

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*"When a young physician asks me what books he should read," Marañón has said, "I always tell him the same thing: For the present, I say, read again the little abstract from which you studied for your examinations, keep it at your bedside and every night, before you fall asleep, go over a few pages. Later on,

subconscious These should be supplemented by other more recent basic works in those disciplines where the greatest progress has been made. A modern anatomy textbook differs little from the Testut s anatomy from which we studied, and the basic chapters of a histology like Cajal s or a physiology like Gley s or Sherrington s have changed little except for sections such as Endocrinology which in Falta s day had an anatomic, morphologic, and constitutional range and today is a laboratory science From the study of glands endocrinology evolved into the study of hormones and then into the study of the latter s biochemical principles

Pharmacology has changed only in the sense that when new substances have been added to the pharmaceutic arsenal, often with unnecessary haste as happened with some antimalarials and chemotherapeutics which looked promising but because *of their toxicity turned out to be ephemeral*, like the *smoke from a straw fire* But the basic pharmacology of the main drugs has not radically changed

Bacteriology has enriched its panoply with so many new microbes that it requires new supplementary works

Some disciplines like psychiatry which twenty years ago were eminently philosophic, have become biochemical and physiodynamic and have extended their *influence to disciplines formerly far removed from them, such as dermatology* physiology and gynecology

The basic texts from which we studied still point out the broad paths along which medical thought in the different specialties runs and we should not replace them by other texts until these have definitely proved their value by the influence they exercise on contemporary medical thought

But the medical book, the forgotten and even despised medical book, has (with the exception of disciplines such as anatomy physiology and pharmacology which still defend themselves behind the solid walls of huge thick volumes) fought and lost a battle against that elegant nervous aerodynamic publishing expression of our day—the medical monograph. The monograph is not a book but the x-ray

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choose any modern book, but study it thoroughly and use whatever time you have left over from such work to read the journals, *only try to get those journals that carry a selection of abstracts which fortunately are so much in fashion. One of these abstract journals is as valuable as ten other journals read at first-hand.* Only when you wish to do research into given area of Medicine is it logical and necessary for you to go conscientiously through those piles of journal which some people think are indispensable to fulfill the mad ambition of "keeping up to date "[19]

1 "Present-day science suffers from an excess of scientism, from an immoderate avidity for everything that springs up under the name of science but which is [illegible]ally detrimental to true science. For true science is signalized by submission to the strict quarantine of the present. 'Scientism can be recognized in the fetish-worship of the latest information. Strict science, however demands that late-arriving discoveries be given time to settle before they acquire definite status. True science always takes such precautions and is, by definition, built from material acquired the day before yesterday

"True science therefore does not take the form of the book right off the press, but of the treatise the well thought-out manual and, even more important the epitome that small volume the student carries around in his pocket [illegible]d leaves [illegible] his bedside at night And not only the student for the epitome should also be the inseparable friend of the teacher There is nothing more valid than the advice that everyone should go back to his school-book every thirty years Despite the disconcerting torrential progress of learning today [illegible]here are certain unshakable starting-points without which all the later evolution is [illegible]

of a book, it is not a matron but a girl not a symphony but its constituent chords condensed into an intellectual shorthand to satisfy the haste of an impatient generation.

Just the same the medical book is still as it was in Vesalius time, the cornerstone of the monumental fortress of medical knowledge in our atomic age. Medicine is a science whose progress is announced in medical journals but is consolidated only in books. For the young physician the medical book is a guarantee of the classic solidity of his know-how just as for the aging practitioner it is a companion whose wisdom has grown alongside his own through the years

Faced with the frightening number of medical books incessantly published all over the world the physician must learn to discriminate in his reading He must *select* Life has become too complex and too difficult and no man can today visit all countries, as Marco Polo did nor can he work at all professions, as Leonardo da Vinci did he cannot love all women as Casanova could nor read all the books as Thomas Linacre did There was a writer Thomas Wolfe, whose zest for life and more life made him want to do all things himself The result was confusion—bewitching perhaps in literature but pathetic in life—in all his works and even in his life as evidenced by his leaning on the age-old stone embankments of the romantic Seine only to pine for the dank smells of the Brooklyn Bridge.

The physician s library can be selective and still range from the austere simplicity of Thomas Sydenham and John Radcliffe* to the splendid humanism of Guy Patin and William Osler

MEDICAL JOURNALS AND THEIR MISSION

Medical journals constitute the principal source of medical information today Every year 5000 medical books are published, 900 of them in the United States and from 4000 to 5000 medical journals, nearly 1500 of these in the United States. These journals are classified into three groups monthly (33 per cent) bimonthly and quarterly (33 per cent), and the remainder weekly annually or sporadically The volume of medical journals today is so great that there are special journals devoted to abstracts *of abstracts* appearing in other journals.

It has been calculated (Nathan Flaxman)[illegible] that 5000 of the medical journals published in a single year represent about 11 million pages of text which, if aligned,

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*The business he [John Radcliffe] was intent upon was no less than the Preservation of Mankind, and this he did not endeavor to make himself Master of, by an tedious Application to the Rubbish of Antiquity in old musty Volumes, that requir d Ages to be thoroughly perus d in, but by careful Examination of the most valuable Treatises that saw the Light from modern. His Books, while he was Student of Physick, for so we must term him, till he became Practitioner were very few but well chosen: So few indeed, as to make Dr Bathurst, the Head of Trinity College, who, notwithstanding his Seniority in the University kept him Company for his Conversation, stand in Surprize, and ask, Where was his Study? Upon which, pointing to few Vials, Skeleton, and Herbal he receiv d for Answer Sir this is Radcliffe Library "[illegible]

would stretch from Chicago to Seattle, Washington.* No one therefore, can possibly even scratch the surface of such a huge mass of literature but it *is* possible to pick out the highlights of medical information. Above all, we must decide what it is that we *must* read what we *should* read, and what we *want* to read These should be our three criteria in the selection of reading material

We should read everything of immediate practical significance to our daily clinical tasks scientific research or professional teaching In selecting such material the practicing physician can be guided by the requirements imposed by his own daily clinical practice keeping informed particularly on all new diagnostic methods or therapeutic weapons related to the cases he is treating

The research worker is in a different position. Not only must he know almost everything other research workers are doing—in case he can use any of it in his own research and thus save himself years of work— but he must also keep up-to-date on the most trivial developments in his own field of research, even though such data may not be of immediate practical importance, because in research anything may suddenly become important.

The professor of medicine must know everything that improves or changes the subject matter he teaches, everything that expands the area of medical learning he must enrich his basic material with the newest contributions e.g antibiotic medicine which has changed the teaching of the natural history of infections In addition he must be informed about everything that may widen the cultural horizon of teaching and finally everything that contributes to the progress of medicine.

Thus we see that the practicing physician must be guided by his daily *needs* the research man by his *duty* to expand his research, and the teacher by his *desire* to enrich and improve his teaching But to a certain degree all three the practitioner the research worker and the medical teacher should engage in all three categories of reading devoting the greatest part of their time to what they *must* read, what time they have left over to what they *ought* to read and any time they can steal to what they *want* to read.

Frequently what one *must* read can be found in the basic medical texts and reference works what one *ought* to read in the most important medical journals and what one *wants* to read in the classic books we discussed earlier

But reading medical journals is in itself a problem, no matter how much we limit our selection There are three ways of acquiring the medical articles we want to read by subscribing to the journals that publish them, by visiting medical libraries or by writing to the authors for reprints First, however we should find out *what* is being published so that we may select what to include in our daily curriculum of reading.

The subjects of articles appearing in journals fluctuate with medical fashion. In 1945 there were 50 articles on cortisone; in 1952 there were 1100 articles. There are topics, such as peptic ulcer are "old friends who never die and thus manifest their professional importance In the United States, in one year alone there appeared 175 articles on surgical treatment for peptic ulcer and 120 on medical therapy for the same disease, also 200 articles on arteriosclerosis and as many more on child sex hygiene

The answer to this problem are the journals of medical abstracts, which if well done enable us to pick out quickly the best grain from the fertile crop of recent findings.

There are two types of journals of medical abstracts One carries practically everything published in a given specialty The other is selective rather than exhaustive it gives the practitioner only what is of immediate practical importance particularly in such specialties as internal medicine, obstetrics, and gynecology Other specialties, such as endocrinology and psychiatry require that the physician know if only for reference all that is happening in these fields in order to exercise his profession with skill.

Medical abstracts unfortunately are not always well done as a physician is hardly the fittest person for this task. Perhaps the solution would be a standard form for abstracts of a predetermined length and structure, calling only for the fundamental data of the work. Medical editors would then polish and round out such abstracts into an acceptable final form. This certainly would simplify the reader's task. At present, however the reader must be content with what is available.

Actually an abstract should be a complete short short story with a beginning a middle, and an end. A medical abstract should follow figuratively the same procedure used by the Indians of Ecuador when they shrink a human head to the size of an orange without spoiling the harmony of its proportions

Of course physicians must be careful not to fall victims to what Marañón called scientism. To have absol te faith in everything labelled science, or to convert into dogma anything published by well-known journals, is to emulate the physi cians who for hundreds of years believed blindly in the books of Galen and Paracelsus.

The danger of dogmatism in medicine lies not in whether the dogmas are good or bad but in their being dogmas There is danger in replacing experience and re search by authority and in attributing infallibility to the least infallible of all sciences medicine

Many physicians bewitched by scientific dogma, sacrifice the simplicity of basic information, which can be as placid as a little water cupped in the palm of the hand, to the turbidity of a torrent of scientific erudition, muddled even further by the mass of bibliography with which some authors burden their work, perhaps to cover up their sterility of thought.

We often forget that the immortal works bequeathed to us by the greatest teachers of medicine are built on a solid framework of classic data, with personal ideas and experiences woven around it and only a pertinent quotation here and there.

In this respect, Marañón said "Our information should be, in whole, made up of some exact truths, those which emerge from the sea of notions to be revised. In other words, to know is not only to know but to know and to doubt, and therefore not to know everything

The third important source of scientific information for the doctor today a source worthy of a place alongside textbooks and medical journals, is the scientific literature prepared and sent to doctors by pharmaceutic companies

Only a few years ago such literature was considered—rightfully so—mere advertising propaganda in the worst sense of the term Today the medical literature issued by pharmaceutic companies, and often prepared by medical advertising agencies has become an important source of study consultation, reference, and medical education Specifically in the fields of antibiotics vitamins biologic products and hormones, it can be said that pharmaceutic literature is not only abundant but also precise effective, ethical and educational.

To a certain degree the evolution of pharmaceutic advertising has followed a course that I would compare to the evolution of painting in history Classic painting represented especially the physical bulk of objects and persons the impressionists relegated photographic representation of physical bulk to a subordinate level and presented lights and shadows modern surrealistic art represents the idea of things the very soul of an object. For Velázquez, a human being was the specular image of his physical make-up for Seurat, the human being was a conglomerate of tiny polychrome dots of light for Picasso he is a geometric abstraction Summing up, classic art represented *things* impressionism, the *light* of things modern art, the *idea* of things Classic art was photographic and visual impressionism appealed to the sensory and emotional image modern art, to the intelligence as it presents *the concept* of things

Pharmaceutic advertising began by presenting a photograph of the *products* followed by a verbal description and a cumbersome iconography All past pharmaceutic literature is cluttered up with bottles pills ampules and salve tubes The revolution began when such advertising represented *the properties* and uses of the products involved Modern pharmaceutic literature presents *the idea* behind a given product the philosophic concept that motivates and justifies it A recent campaign of pharmaceutic advertising on the combined use of antibiotics and vitamins for treating the etiologic agent of an infection and the stress caused by it was based successfully on the introduction of such a concept in medical thought and later on the introduction of the product incarnating that idea

In my opinion the medical literature of the future—including medical advertising —will shed its present form and become *educational literature* When a drug is universally accepted and becomes a part of the basic therapeutic arsenal of the physician it no longer needs any advertising it is enough to inform, guide and educate us as to how to use it A vaccine a hormone an antibiotic already tried and proved does not need ad ertising all we need is technical information on how to use it As I see it, the primary mission of medico-pharmaceutic advertising in the fut re will be educational to complete the work of that Preventi e Medicine which is the Medicine of the Future

Meanwhile for the physici n who can winnow the bad from the good in the praises heaped on a drug who has an eye for picking the nuggets out of the cluttered

mine of information for him pharmaceutic literature is a priceless source of medical knowledge and an educational vehicle of unique value. This is especially true of physicians who practice in isolated regions where it takes months for a book or a journal to arrive. This country doctor keeps abreast of the progress of medicine through advertising pamphlets and leaflets, as colorful as a peacock s plumes but which contain information as scientific and precise as the calculations done by a Princeton mathematician

READING FOR IMPROVEMENT

Now we come to the reading done by the physician as a member of society as an individual participating in the life of a nation, a period, a culture, a civilization.

As a human being a physician may enjoy recreational reading novels, short stories, poetry travel books, or humorous literature. As a professional he must read informative literature scientific books medical journals, and other technical publications But as an individual functioning in society who must contribute to his country s growth as a nation and to its universal function, he must read works that help him to improve himself and thus enable him to improve his environment through the influence of his thoughts his words, his pen, and his actions

Such reading for improvement may be classified as scientific (on the progress being made in the biologic, natural and physical sciences), philosophic, historical, sociologic, or reading in the miscellaneous arts

Yet how can one ask the overburdened practitioner to devote time to reading that is not directly related to his profession? If he can hardly keep abreast of the latest developments in his own specialty how will he find time for abstract or theoretical reading of no specific application?

To such objections, I would say that one does not *have* time one *makes* it. We must be time s ragpicker we must copy those great teachers who snatched up the snippets of the gold dust of time those minutes quarters of an hour or half hours wasted during the day in foolish chatter in the overlong telephone call in the newspaper or popular magazine that fell into our hands and that we read out of sheer curiosity in the time-stealing visit from some stranger and those long evenings spent with eyes glued to the television screen Elimination of such unproductive activities would yield the hour or two for the reading we so badly need.

HOW TO FIND TIME TO READ

If we intend to devote an hour or two every day to reading we must organize our time with the greatest caution. Perhaps it would be wise to follow the advice a teacher once gave me to imagine at all times that we are about to embark on an extended journey The day before we leave we do the work of several days, we take care of any number of details rapidly and efficiently we give each minute its just due, and we leave everything in order If we could manage to consider each day as the day before the beginning of a long trip, not only would we have time left for reading but also our lives would be filled with effective activity and success.

There are four sources of time where we can find those precious moments so necessary for rounding out our cultural lives The first and most important source we have just described gathering up the gold dust of time and making each minute yield its maximum value

WAR ON THE CHRONOPHAGES

There is a second source in Goethe's advice, so wisely summarized by André Maurois Let us eliminate from our lives all time-devourers, the cannibals who feed on our minutes and hours, Molière's *fâcheux* whom Montherlant called *chronophages* (time-eaters)

Chronophages Maurois said " have no mercy If you allow it, they will steal your very last moment never realizing that if they had left you alone you might have accomplished something worthwhile. *Chronophages* have no scruples. On the very day war is declared, a callous time-eater will break in on the Chief of Staff to discuss his janitor's conscription. *Chronophages* operate by means of visits telephone calls and letters If you show them any patience or kindness, you commit a grave sin You must treat them without any consideration, for to allow them into your presence is sheer suicide

Goethe once said that If one wishes to do something for the world, one must not allow the world to take hold of one. This is legitimate advice for if we do not succeed the world is the first one to reproach us for being a failure You should not go anywhere the *chronophage* will say for you would be neglecting your work And with his very next breath he adds "Come to dinner tomorrow And you must refuse for he who allows himself to be swallowed up by such people will never see his work completed

The third source of time lies in cutting to the bone the time we allow daily to reading too many newspapers or news magazines. As citizens of a nation and participants in a historical epoch, we should aspire to be well informed about everything happening in the world But to exaggerate such an ambition leads us to devote too many hours a week to reading the same news in different newspapers and various articles on the same subject in different magazines to listening to the same news over the radio at different hours and—*vade retro Satanas* —to watching television programs that we would never see on a theater screen Thus the time we could devote to useful things is sacrificed to a false sense of accomplishment.

In general it is sufficient to read one newspaper a day Nor do we need to read it from beginning to end we should learn to read vertically by catching the essence of what every article or report says As for news magazines one a week is enough to supplement what we have learned from our daily newspaper Repetitious or useless reading material makes us throw away the most precious of treasures and the most difficult to keep time

The next source of time is our spare time What should we do with it? Should we read study indulge in some sport some distraction, or what is called a "hobby? I confess that I am a mortal enemy of hobbies Man's life should be divided into

three parts as harmoniously balanced as possible work, rest, and recreation. Reading should be as much a recreation as a hobby An obsessive hobby that becomes the Moloch of all of one s free time is a fatal error If a hobby—collecting stamps assembling toy trains, breeding canaries—is really so interesting one should devote one s life to it, it should become one s profession. Let us drink from all the cups of entertainment without getting drunk on any one. A hobby carried to extremes may be the reason why a physician has no time for any reading aside from professional texts and news magazines. Many of us love chess the movies the theater and there is no need to give up such pastimes altogether but we must decide what is more important in the scale of life s values to be an expert" in one or several hobbies, or to be a good physician and a valuable member of the society in which we live. The choice should not be open to any doubt.

To summarize this subjective evaluation of what a physician should do to make time for reading and studying we must not allow details to consume our lives we must delegate to others everything they can do for us we must live *deeply* rather than fast, doing the important things first and the unimportant ones never

HUMANISTIC READING

What should the physician read in history philosophy the arts and the sciences? Let each person choose his own road to humanism.[33] The roads leading toward that goal are as infinite as the roads toward the sea, but each man s or woman s road is as individual as the road to Damascus was for Saul of Tarsus.

It is a good idea to select a *basic* text in each one of the fields mentioned using it as a compass on our voyages over the seas of culture. It should be a clear complete, and not too lengthy text that can be mastered without undue effort and supplemented with monographs short books, and magazine articles on the topics of greatest interest to us.

Along with this general cycle of basic reading, on which we graft epicycles of complementary reading, we should include the classics in science philosophy history literature, and the arts, for their voices not only bring back the past, but allow us to commune with the great historical figures whose thoughts are always an inspiration and whose lives may yet teach us something about our own Allenby s campaigns in Arabia and Schliemann s discovery of the jewels of Helen of Troy derived from the fact that they had read the *Iliad* When General Lyautey was unjustly relieved of his post in Morocco he consoled himself by reading Shakespeare s *Coriolanus* [34] Poincaré found enlightenment in Tacitus and Marcus Aurelius two writers who have always provided guidance for statesmen, just as Kipling and Cervantes have inspired men of action, and Romain Rolland, Aurobindo Ghose, and Ramakrishna have pointed the way for humanists and thinkers

Naturally reading for improvement demands respect and concentration While a medical journal, a monograph, or a recent article can be read between visits to patients, on the subway or in a plane, in one s office or in a hospital corridor the great classical texts in medicine or other sciences, in philosophy or history require the proper place time and state of mind. That is the minimum respect we can show

to their authors. The reader should become worthy of those great books, for as Miguel de Unamuno said of *Don Quixote* the important thing is not what the author meant, but what each reader sees or even creates

To obtain the most out of the great books, we must approach them as travelers approached the old Spanish inns in Don Quixote s time. Since generally no food was to be had at these inns the abundance and savor of a traveler s repast depended on how well his knapsack was stocked When we read Gibbon or Oliver Wendell Holmes, Taine or Osler Voltaire or Cajal, what we derive from them is in direct ratio to the devotion and respect we give them. From books as from love we receive as much as we give

IN PRAISE OF READING IN THE HISTORY OF MEDICINE

The physician must include in his program of reading for improvement books of medical history and the great works of the classical physicians The rebirth of the History of Medicine has impelled many physicians—at first out of intellectual curiosity and later because of a spiritual need—to peer into the well of medical classics and to recognize with astonishment that many elementary basic truths long forgotten, can be learned from them From Cajal as from Claude Bernard, we may not learn to diagnose the rickettsiaes but these masters can help us to develop medical and clinical acumen and to apply it competently and with assurance in diagnosis and therapy Such classic books are like the ancient worn out but indispensable tools bequeathed by a watchmaker to his son and by the latter to his own son, tools which often are of greater value than the most modern instruments For old tools were fashioned on the basic requirements of the trade as instinctively fore seen by the born artisan. I personally read the classics often—although not as often as I would like— I reread *Don Quixote* every night at bedtime opening the book at random, for I know that, like a healthy tree that yields only good fruit any page will provide food for thought.

There are physicians who rebel at mixing required reading with the reading of medical classics which they in any case consider a boring and even dangerous pastime Perhaps they are at bottom afraid that the classics may disagree with the ideas they themselves entertain with the methods they practice like the Caliph who caused the library at Alexandria to be burned because If all these books are in agreement with the Koran we do not need them, and if they disagree they lie

There is another type of physician who is somewhat afraid of too much reading for unconsciously he subscribes to the proverb The librarian who reads is gone!' He therefore refuses to read anything not directly related to the practical needs of the moment Others like Sir Thomas Browne, limited their pocket library to three books a Greek testament, some of the aphorisms of Hippocrates and a text by Horace

But fortunately there are many physicians who love good books and for them reading—and dreaming about what they read—is one of the most pleasant occupations of their lives With Edgar Allan Poe they can say to dream is the work of my life At the head of that legion stands the Goethe of modern medicine Sir

William Osler who adopted as his model Sir Thomas Linacre because he was an example of a life of devotion to learning to medicine and to the interest of humanity It was Osler who said For the general practitioner a well-used library is one of the correctives of the premature senility which is so apt to overtake him It is astonishing with how little reading a doctor can practice medicine, but it is astonishing how badly he may do it. [36]

But we should never hasten to buy a book unless we are first certain that we wish to live with it and not just to pass the time away We should buy only those books worthy of being read, reread and kept, which incidentally would discourage bad writers who waste the time of unsuspecting readers. And in selecting such books let us not be guided only by the critics—often biased and wrong—for they are only human, many times too human in their judgments.

C. G Osgood[37] adopted Bacon s habit of differentiating between books to be chewed, swallowed and digested and books to be relished He recommended that we read first the index, the preface, and one or several basic chapters then in both directions, forward and backward, until we have a perspective of the entire book, as the test of whether we want to buy it or not That was also the practice of the great Spanish historian Menendez y Pelayo who possessed the amazing gift *of grasping in less than* half an hour *the essence of a 400-page book, the* something good which Don Quixote said that even the worst book contains

I confess that I am guilty of reading too rapidly Yet, although my *tempo* is rather fast and although I have developed a method of keeping seven or more books—excluding medical readings— moving each week, thus averaging about a book a day over the period of a year I have noticed that time is making me more selective in my reading, for I humbly recognize the enormous difficulty of imprisoning in the limited time and space of a human life even a small part of human knowledge.

HOW TO SELECT READING MATERIAL

In selecting basic reading for improvement, we should be on guard against books of passing interest which appear and disappear as quickly as certain species of butterflies leaving no trace of their existence except the gold dust into which they turn when crushed beneath the critic s unmerciful fist.

In general, we should follow Emerson s dictum never to read a book less than a year old Perhaps it is wise not to read books that are too recent. A reasonable amount of time should elapse after their publication to give us the opportunity of comparing them with other books and authors.

Some books have survived through the ges because they are veritable monuments of learning such as Sir Thomas Browne s *Religio Medici* or Hippocrates

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Conan Doyle thought differently "Reading is made too easy nowadays, with cheap paper editions and free libraries. A man does not appreciate at its full worth the thing that comes to him without effort. Who now ever gets the thrill which Carlyle felt when he hurried home with six volumes of Gibbon *History* under his arm, his mind just starving for want of food, to devour them at the rate of one day A book should be your very own before you can really get the taste of it, and unless you have worked for it, you will never have the true inward pride of possession."[?]

Aphorisms These books are like museum halls filled with wonders that we can visit whenever we have the time and the inclination but in no circumstances should they replace books of permanent relevance, the true classics which are classics not only because of their literary value but also because of their philosophic depth

The physician should learn to discriminate in his reading for improvement. He should learn that it is better to know a few classic authors and universal themes thoroughly than all authors and themes superficially I admit I am inclined to worship encyclopedic knowledge, but only a *cultured* encyclopedism, the kind that affords one a panoramic view of human learning through time and space. On the other hand, I believe that the physician should above all know his specialty thoroughly before wandering into other professional fields

Just a few friends from among the giants of classic medicine are enough to enrich the life of a physician. If a physician knows thoroughly only the works of Claude Bernard, Ramón y Cajal William Osler Charles Sherrington, Sigmund Freud and Ivan Pavlov supplemented by recent works on medicine, he is a cultured man, a humanist and a true scientist.

The value of the history of medicine increases enormously when we allow the great philosophers to be our guides as the classical Virgil guided Dante, through the caverns of Hell which are the complexities of life today

Sydenham s healthy Hippocratic criteria, Oliver Wendell Holmes humorous philosophy Claude Bernard s skillful experimental eye, Cajal s noble precepts are more important to the physician s professional education than the at present fashionable hastily written little books which try to make up with a torrent of bibliographic material for their lack of those fundamental concepts within which the physician s learning should be framed

There is one infallible criterion in choosing the authors who are to be the constant spiritual companions of our lives and that is to select those who are consecrated by history A person or even a whole generation may be mistaken in their judgment of a contemporaneous work, but humanity is never mistaken when it consecrates the works of great men.

L ENVOI

To read—and to read is to dream—is as important in the physician s life as clinical experience At the Mayo Clinic there is a multicolored stained-glass window representing the evolution of medicine and bearing the following words by Dr Charles Mayo "Let me partake of your experiences and I will *let you share my dreams*

A physician should make list of the great philosophic historical, and scientific work he should know for unless one is acquainted with those monumental works one loses some of one human value. Whether it is read chapter by chapter religiously every day or on vacation, or during a siege of illness I believe that *Don Quixote* can be read in its entirety alongside *The Decline and Fall of the Roman Empire* Plutarch *Louis* Balzac *Candide* *Humanism* the works of Dostoyevsky Tolstoy Dickens Marcel Proust, Burton *Anatomy of Melancholy* the works of Shakespeare, Osler Kant, and Spinoza. And when some of these have been read, our moral we ght is increased and lif takes on new dignity

To conclude, let us listen, before we close the "Magic Door," to the fitting words of the Scottish physician and storyteller Conan Doyle: "And now, my very patient friend, the time has come for us to part, and I hope my little sermons have not bored you over-much. If I have put you on the track of anything which you did not know before, then verify it and pass it on. If I have not there is no harm done, save that my breath and your time have been wasted. There may be a score of mistakes in what I have said—is it not the privilege of the conversationalist to misquote? My judgments may differ very far from yours, and my likings may be your abhorrence; but the mere thinking and talking of books is in itself good, be the upshot what it may. For the time the magic door is still shut. You are still in the land of faerie. But, alas, though you shut that door, you cannot seal it. Still come the ring of bell, the call of telephone, the summons back to the sordid world of work and men and daily strife. Well, that's the real life after all—this only the imitation. And yet, now that the portal is wide open and we stride out together, do we not face our fate with a braver heart for all the rest and quiet and comradeship that we found behind the Magic Door?"[2]

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Biographical Notes on the Contributors to the Symposium on Medical Writing

Dr Henry E. Sigerist was born in Paris in 1891 of Swiss parents and educated in France and Switzerland he studied oriental languages in Zürich and London and then medicine at the Universities of Zürich and Munich During World War I he served two years in the medical corps of the Swiss army As Privatdozent of the History of Medicine at the University of Zürich, he was called at the age of 33 to Leipzig to succeed Karl Sudhoff and to direct what was at that time the best institute of the history of medicine



He came to America at the invitation of Johns Hopkins University in 1932 to succeed Dr William H Welch and to head the newly created Institute of the History of Medicine Since 1947 he has been Research Associate in the History of Medicine of Yale University (in absentia). He lives in Pura, Switzerland where he is engaged in writing an eight volume History of Medicine He is the author of numerous books and papers Dr Sigerist is considered by many to be the foremost living historian of medicine His teaching writing and exemplary dedication to the fields of historical and cultural medicine have influenced physicians historians and sociologists the world over

Dr Hans Selye was born in Vienna in 1907 and studied in Prague, Paris and Rome. He received his medical degree from the German University of Prague in 1929 and two years later took his PhD at the same university He was then awarded a Rockefeller research fellowship which brought him to Johns Hopkins University and later to McGill University where he became Associate Professor of Histology

In 1945 Dr Selye (now Professor) took up the post of Director of the Institute of Experimental Medicine and Surgery at the University of Montreal, a position he still holds In the meantime he had become a Canadian citizen During the war he served as an Expert Consultant to the Surgeon General of the United States Army



His investigations into the problem of stress began in 1936, with a modest laboratory and restricted facilities Prof Selye now has 40 assistants helping him in research Recognized as one of the foremost endocrinologists today he is the author of a six volume *Encyclopedia of Endocrinology* Among his other works are *Stress The Physiology of Exposure to Stress* and a series of *Annual Reports on Stress* the

most recent of which is to be published shortly As an author Prof. Selye has written over 400 scientific papers.

He is an active member of several scientific and medical societies throughout the world and an honorary member of numerous others. He has received several awards including the Casgrain and Charbonneau Prize for original work in the prevention and treatment of disease

Dr Hugh Clegg was born on June 19 1900 and took his medical degree at Cambridge University where he also took first-class honors in a science degree. He was intern at St. Bartholomew s Hospital and at the Brompton Hospital for Diseases of the Chest.



He first joined the staff of the *British Medical Journal* in 1931, and was appointed editor in 1947 He has for many years furthered the advance of medical education and writing, serving as chairman of the UNESCO Committee on Co-ordination of Abstracting in the Medical and Biological Sciences He initiated and organized the First World Conference on Medical Education, held in London in 1953 and edited its proceedings

Dr Clegg has written five books on medical subjects and during four years worked on a revision of Black s Medical Dictionary He is also advisory editor of the medical section of Chambers Encyclopedia. Among other positions he is vice-president of l'Union Internationale de la Presse Médicale and a member of the Medical Panel of the British Council He lives in a village near London and is married to Baroness Kira Engelhardt, daughter of a Russian baron, by whom he had one son and one daughter

Dr Walter C. Alvarez was born in San Francisco on July 22, 1884 and took his medical degree at Cooper Medical College (Stanford) in 1905. His postgraduate studies were done at Harvard Medical School. After several years of private practice, he became an associate professor of medicine at the University of California. He joined the Mayo Clinic in 1926, as Senior Consultant of the Division of Medicine and later Professor of Medicine, a position from which he retired with the title of Professor Emeritus in 1950.



Since that time, Dr Alvarez has devoted himself to medical journalism. His articles on popular medicine ppear four times a week in 80 newspapers with a combined circulation of 12 million. He is editor of the journals *Geriatrics* and *Modern Medicine*

One of Dr Alvarez best known works is the

667-page *The Neuroses* Another work that has been widely read by medical men and lay public alike is his *Nervousness Indigestion and Pain* His published medical articles total over 900.

Among other distinctions, Dr Alvarez is a Fellow of the American College of Physicians, member of the Association of American Physicians the American Physiological Society the American Society for Clinical Investigation, the Society of Experimental Biology and Medicine, and the American Gastroenterology Association, from which he received the Friedenwald Medical Medal He is married and lives in Chicago

Dr Félix Martí-Ibáñez, born in Cartagena, Spain received his medical degree from the University of Madrid. From 1931 to 1939 he practiced as a psychiatrist in Barcelona and lectured on psychology medical history and art He was also editor of several medical and literary journals and published two novels and numerous books on eugenics psychology and the history of medicine



In 1937 Dr Martí-Ibáñez was appointed General Director of Public Health and Social Service of Catalonia In 1938 he was appointed Under Secretary of Public Health of Spain He officially represented Spain at the World Peace Congresses held in Geneva, New York and Mexico City He was wounded while serving as a major in the Medical Corps of the Spanish Air Force.

After his arrival in the United States in 1939 Dr Martí-Ibáñez held the position of Medical Director with three leading pharmaceutical concerns He also lectured in many Latin American universities and is an honorary member of fifteen medical, historical and psychiatric associations

He participated in the International Congresses of History of Medicine History of Science Psychology and Psychiatry held since 1950 in Amsterdam, Paris, Stockholm, Nice and Rome and has published papers on psychiatric and historicomedical subjects in American and European journals He is a member of the Foreign Press Association and the Stage and Screen Foreign Press Club and contributes columns to Latin American newspapers. Articles and short stories by Dr Martí Ibáñez have appeared in *Esquire Town and Country Gentry Art & Architecture* and fantasy story magazines

Dr Martí Ibáñez was recently awarded the Order of Carlos J Finlay of Cuba and Fellowship Awards by the American Medical Writers Association of America and the New York Academy of Sciences He is President of MD Publications Inc. publishers of seven leading medical journals and Editor of the INTERNATIONAL RECORD OF MEDICINE AND GENERAL PRACTICE CLINICS, Associate Editor of ANTIBIOTICS AND CHEMOTHERAPY and ANTIBIOTIC MEDICINE, and International Editor of the JOURNAL OF CLINICAL AND EXPERIMENTAL PSYCHOPATHOLOGY